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Steel Corporation Gaining

In Orders, Specifications and Production, but Business of Many Companies Shows No Improvement

The United States Steel Corporation continues to gain, not only in specifications against old contracts, but also in new business and a better record has been made for the first half of July than for the same period in June. The Corporation has added three blast furnaces to the active list since July 1. It continues to operate at about 65 per cent of ingot capacity. In spite, however, of the encouraging reports from the Steel Corporation plants, general market conditions continue very unsatisfactory and even the most optimistic find difficulty in discovering indications that improvement may be expected at any time in the near future.

Pig Iron

The principal sales of pig iron during the past week were 10,000 tons of malleable to the Eastern Malleable Iron Co., 10,000 tons of basic to a St. Louis melter and 10,000 tons of pipe iron to Lynchburg, Va., buyers. An inquiry for 15,000 tons of basic from Kokomo, Ind., is about to be placed. The American Brake Shoe & Foundry Co. has purchased 2,500 tons of various grades. The pig iron market still drifts along in a very listless manner and production is being gradually curtailed.

Bars

Agricultural implement manufacturers continue actively in the market, and in the Chicago district contracts for about 50,000 tons have been made. The International Harvester Co. has not yet contracted for its requirements. Some very close figuring is being done. In a few cases, mills have accepted contracts up to Jan. 1 at 1.10c, Pittsburgh. The usual price is 1.15c up to Jan. 1. A Wilkesbarre, Pa., company has contracted for a large tonnage of axle bars. Bar iron is extremely dull and prices are ragged.

Cast Iron Pipe

Active competition between American and English makers on the year's requirements of water pipe for the city of London, England, resulted in R. D. Wood & Co., Philadelphia, bidding 25 cents per ton less than the English Syndicate, but the sentiment of the English metropolis was so strongly in favor of awarding the contract to English makers that it was placed with the English Syndicate.

Railroad Buying

Rail sales of the past week were at a fair rate and make a total of somewhat more than 40,000 tons, including 16,000 awarded to the Tennessee company for the Southern railway and 17,000 for the Rock Island, of which 10,000 will be rolled by the Colorado Fuel & Iron Co. and 7,000 by the Illinois Steel Co. The Tata Iron & Steel Co., of India, which, it is understood, has 20,000 tons to market in this country for the year, beginning July 1, has been offering rails to northwestern roads, but has not yet made any sales. Inquiries for cars now pending amount to fully 10,000.

Plates and Sheets

The three new battleships to be built for the government will require about 14,000 tons of steel in addition to the armor plate. The demand for plates is not active, but prompt delivery is often requested on the limited tonnages being placed, which indicates that stocks are low. This is true particularly of boiler plate. The sheet market in the east shows some improvement, but in most parts of the country it is extremely dull and prices are irregular.

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Some Effects of Foreign Competition

EFFECTS of the Wilson-Underwood tariff law are being shown in a very impressive way at the present time. A particularly striking illustration of the delights of inviting foreign competition is furnished by the failure of the Alton Steel Co., Alton, Ill. This company, which has been in operation only a short time, manufactures steel hoops and cotton ties. It has been well managed by men who were thoroughly familiar with the business and the plant was built according to the latest ideas of able engineers. In spite of its management and modern construction, the new company could not compete with foreign prices. As published in THE IRON TRADE REVIEW of July 2, the Carnegie Steel Co., the leading manufacturer of cotton ties, announced a price of 65 cents per bundle of 45 pounds, Pittsburgh, for 1914. This was the lowest price in many years, if, indeed, not the lowest that has ever been made. It was necessary to make this price in order to compete with the foreign price, which is 80 cents, delivered Galveston, while the Carnegie price would be equivalent to 78 cents, delivered Galveston. It is doubtful whether even the Carnegie Steel Co. can make any money at the price quoted, which is equivalent to about 1.44c a pound for the ties, including the fastenings, and the failure of the Alton Steel Co. indicates clearly that the smaller manufacturers cannot compete with the foreign makers of cotton ties.

Even admitting that one or two of the largest companies can compete with the foreigners, is it sound economic policy to crush the life out of the smaller concerns?

Another striking illustration of the effect of competition from abroad is furnished by the experience of American manufacturers, as reported in THE IRON TRADE REVIEW last week, in competing with German sheet mills. For some time past, very low prices have been made on sheets throughout the United States, but when makers of eastern Pennsylvania made a quotation on blue annealed sheets for a Montreal buyer, they encountered a price $4 below the lowest price which has been made by manufacturers in this country.

We do not wish to be an alarmist, but we shall not be at all surprised if, in the near future, more hard facts showing the beauties of free trade are presented for the consideration of the American people.

A Welfare Survey

WILLIAM G. Mather, chairman of the employers' welfare committee of the National Civic Federation, has issued a letter calling attention to the effort which is being made by the federation to obtain more definite information as to what is being done for the welfare of employes throughout the country. The industrial economics department of the National Civic Federation is conducting a survey of social and industrial conditions in the United States at the present time as contrasted with those of about 30 years ago. Wonderful progress in welfare work has been made within a very few years and greater encouragement for future effort will undoubtedly result from the survey which has been inaugurated. We take pleasure in calling attention to this survey and in urging manufacturers to lend their prompt and enthusiastic support.

Sound Principles Upheld

OPINIONS are bound to differ as to whether the rates on pig iron from the Birmingham and Virginia districts to northern points are more equitable than those which have prevailed for some time. It is impossible to be absolutely just in determining what rates should prevail. Fixing of rates is not an exact science. It is a comparatively new work for a public commission. Progress is being made, however, and in the Sloss-Sheffield case, some sound principles are laid down.

Commissioner McChord, who is the author of the report of the commission, gives the history of the sliding scale arrangement which was entered into in 1881 by the railroads and furnace operators, providing a schedule of rates based upon the market price of pig iron.

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This arrangement continued until 1894, when specific rates were published, but the rates thereafter were made with relation to the selling price of pig iron and were revised at intervals to follow as nearly as practicable the market fluctuations. The commission refuses to admit that the rate of hauling should have any connection with the price of pig iron, but says it is fair to assume that the rates charged during periods of unusual prosperity were sufficiently above the normal to make up any decrease in profits sustained during leaner years. Hence the highest rate which has prevailed should not be continued indefinitely. This, we believe, is sound reasoning.

Another excellent point is made by the commission when it declares that the southern operator is entitled to every advantage growing out of his economic location, just as the northern operator is entitled to any benefit that may accrue to him by reason of his proximity to the markets, and these advantages should not be disturbed by fixing freight rates predicated upon the cost of production. In other words, the laws of nature should be allowed to operate and every community should be permitted to enjoy the benefits to which it is entitled.

Truth About the Colorado Strike

IN THESE days, when congressmen are showing disgusting subserviency to union labor demands, it is refreshing to read a speech like that delivered a few days ago in the House Representatives at Washington by Congressman Kindel, of Colorado. Turning to the Congressional Directory, we find that Mr. Kindel, in his modest seven-line biographical sketch, says that he had a limited education, served an apprenticeship in upholstery and mattress making, later engaged in manufacturing mattresses, and since 1892 has been in the courts contesting discriminative freight and express rates. This little biographical sketch certainly would not indicate that Mr. Kindel is prejudiced in favor of corporations. In fact, he says in his speech that much of his life has been devoted to what he believed to be just criticism of many corporate abuses.

But Mr. Kindel knows what the facts are in regard to the Colorado situation and he proceeds to tell them in a very courageous manner. His speech is short and every line of it is worth reading. Mr. Kindel declares that the necessity for the maintenance of the open shop, for which the mine owners of Colorado are fighting, involves a principle far from local in its character. He says that the employers of labor in Colorado who are standing for this principle deserve, instead of denunciation, the encouragement and support of every patriotic citizen.

As to the remedy for existing conditions, Mr. Kindel says:

> *"There is but a single effective remedy—let maudlin sympathy for those who stand in open rebellion against constituted authority be banished.*
>
> *"Let all good citizens encourage and assist the officers of the law in faithfully and vigorously executing the statutes and constitutional provisions of the state of Colorado and of the United States.*
>
> *"In this way, and in this way only, under existing conditions, can the rights of all parties be restored and preserved and the dignity of a great state and the greatest country on earth be maintained."*

More talk of this kind and more action in harmony with it, instead of sickening servility to labor agitators, are imperatively demanded by the best interests of employers and faithful employes alike.

The organization of the Foreign Trade Council, as the result of the recent foreign trade convention held in Washington, is an important development in the effort now being made to extend the commerce of the United States. Under the able chairmanship of James A. Farrell, and with the assistance of prominent business men from different parts of the country, the Foreign Trade Council cannot fail to do much to promote the object of the convention, which was declared to be a more systematic development of foreign trade through the creation of a merchant marine, establishment of American banks abroad and governmental cooperation in foreign trade.

Prices Present and Past

Quotations on leading products today, average for last month, average for three months ago and average for July, 1913. Prices are those ruling in the largest percentage of sales at the dates named.

	Today's prices.	Average for June, 1914.	Average for April, 1914.	Average for July, 1913.
Bessemer pig iron, Pittsburgh..	$14.90	$14.90	$14.90	$16.65
Basic pig iron, Pittsburgh.....	13.90	13.90	13.90	15.25
No. 2 Fdy. pig iron, Pittsburgh	13.90	13.90	14.15	14.75
Northern No. 2 Fdy., Chgo.....	14.00	14.25	14.25	15.05
Lake Superior Charcoal, Chgo..	16.00	15.75	15.50	16.75
Malleable Bessemer, Chicago...	14.00	14.25	14.25	14.85
Southern No. 2, Birmingham...	10.00	10.37	10.43	10.45
Southern Ohio No. 2, Ironton..	13.25	13.50	13.50	14.20
Basic, eastern Pa.....	14.25	14.00	14.25	15.25
No. 2X Virginia furnace.....	12.75	12.75	12.75	13.00
No. 2X Foundry, Philadelphia.	14.75	14.75	15.00	15.50
Ferro manganese, Baltimore....	37.50	38.00	38.50	58.50
Bessemer billets, Pbgh. & Ygn..	19.50	19.75	20.80	26.50
Op. h'th sh. bars, Pbgh. & Ygn.	20.00	20.75	21.60	27.50
Bess. sheet bars, Pbgh. & Ygn..	20.00	20.75	21.60	27.50
Op. h'th billets, Pbgh. & Ygn..	19.50	19.75	20.80	26.50
Steel bars, Pittsburgh.....	1.10	1.11½	1.15	1.40
Iron bars, Philadelphia.....	1.17	1.17	1.22	1.47
Steel bars, Chicago.....	1.28	1.29	1.38	1.58
Tank plates, Chicago.....	1.28	1.28	1.32	1.63

	Today's prices.	Average for June, 1914.	Average for April, 1914.	Average for July, 1913.
Structural shapes, Chicago.....	$1.28	$1.28	$1.35	$1.63
Iron bars, Cleveland, local del'y	1.20	1.20	1.25	1.56
Iron bars, Chgo. mill.....	1.05	1.10	1.15	1.50
Beams, Pittsburgh	1.10	1.11½	1.18	1.45
Beams, Philadelphia	1.25	1.25	1.30	1.60
Tank plates, Pittsburgh.....	1.10	1.10	1.15	1.45
Tank plates, Philadelphia.....	1.25	1.25	1.30	1.65
Sheets, blk., No. 28, Pittsburgh.	1.80	1.82	1.92	2.25
Sheets, blue an., No. 10, Pbgh.	1.35	1.35	1.40	1.72
Sheets, galv., No. 28, Pbgh.....	2.75	2.80	2.92	3.32
Wire nails, Pittsburgh.....	1.50	1.50	1.60	1.70
Connellsville fur. coke, contr...	1.85	1.75	2.00	2.50
Connellsville fdy. coke contr....	2.40	2.35	2.50	3.00
Heavy melting steel, Pbgh.....	12.00	12.00	12.00	12.50
Heavy melting steel, east'n Pa..	10.50	10.75	11.00	11.50
Heavy melting steel, Chgo.....	9.50	9.75	9.50	10.50
Heavy cast, eastern Pa.....	12.50	12.50	13.00	13.25
No. 1 wrought, eastern Pa.....	12.00	12.50	13.00	14.25
No. 1 wrought, Chgo.....	9.00	8.88	8.50	10.50
Rerolling rails, Chgo.....	11.25	11.25	11.25	12.00
Car wheels, Chgo.....	10.75	11.25	11.00	17.00

(For Additional Prices See Page 142.)

Malleable Purchased in the East

And Round Tonnage of Basic is Taken by a St. Louis Melter, But Dullness Continues Throughout the Country

New York, July 13.—A round block of malleable, purchased by the Eastern Malleable Iron Co., the so-called Malleable Syndicate, for plants in New England and New York state, was the principal transaction of the week in the New York and nearby districts. The amount of iron purchased was not known definitely, but is understood to have been 10,000 tons or more for last half and to have gone to Buffalo furnaces. This consumer has been endeavoring to buy upon the basis of $12.50, Buffalo, and it is believed in the trade that it obtained part of its iron at least at around that figure. It still is negotiating for additional iron. The American Brake Shoe & Foundry Co. bought about 2,500 tons of iron for last half, including 1,000 tons of 3 to 7 per cent silicon for western plants, 500 tons of malleable for Lancaster, N. Y., and some tonnage for other plants. The business went to Buffalo and western furnaces. A quiet sale of 1,500 tons of foundry was closed in this district today. A Brooklyn buyer took 600 tons of No. 2X from Buffalo for canal shipment. These sales largely represent the week's turnover. The market at present is quiet, pending inquiries in the metropolitan district reaching not over 1,500 tons and the general tone is not favorable. There still is a good deal of speculation as to the exact limits of Buffalo prices. While some business still is being done at $13, furnace, for No. 2X, there is no doubt that this is being shaded 25 cents and in rare cases, 50 cents a ton. Pennsylvania irons are holding to $14.50 to $14.75, tidewater, for No. 2X. According to reports from abroad this week, American low phosphorus iron containing 5 per cent of copper has been offered in Wales at the extremely low price of 61 shillings, delivered. As this price would be equivalent to the extremely low figure of $13, tidewater, it is believed some special conditions surround the offer.

Pipe Makers Buy Iron

Philadelphia, July 14.—Except for the placing of several sizeable lots by cast iron pipe makers in eastern Pennsylvania and Virginia, the iron market in Philadelphia and contiguous territory is making a rather small showing. Much of the business moving is in small lots and the volume is less than in June, when the statistics of the Eastern Pig Iron Association showed a small increase in unfilled orders and a similar gain in stocks. Lynchburg, Va., pipe makers have been covering for their second quarter requirements and have placed recently probably 10,000 tons of forge and No. 3 with Virginia furnaces. A sale of 5,000 tons was made to pipe makers in this district and smaller lots have been booked by eastern furnaces at $13.75, delivered. There are reports also that some additional large blocks of Alabama irons have been purchased by these consumers. The regular foundry grades show only small inquiry. A Trenton manufacturer of plumbing ware placed 1,000 tons of No. 2X and No. 2 plain. The usual price of northern No. 2X remains $14.75, Philadelphia, with occasional shading. When the reduction of freight rates ordered by the Interstate Commerce Commission goes into effect, Aug. 15, Virginia iron at $12.75, furnace, for No. 2X will be $15.50, Philadelphia, and $15.20, Baltimore, respectively or 25 and 20 cents less. As these prices, especially at Philadelphia, will still be considerably above the market, the reductions still are not expected to place this iron on a competitive basis, although they promise to increase its use in mixtures. Steel making irons are quiet. Basic is in no demand and there remains pending one lot of Bessemer. Low phosphorus is selling in small

(*For complete prices see page* 142.)

lots at $20.50, Philadelphia, for strictly standard and at $17 to $17.50, furnace, for Lebanon grades. English hematite containing 0.02 copper is reported to have been offered at $19.25 to $19.50 at points near by this city.

Pig Iron Prices Unchanged

Pittsburgh, July 14.—The pig iron market in this district is decidedly dull, but prices continue to hold at levels prevailing several weeks. Dealers appear certain that consumers have concluded quotations will not recede, but it is apparent that melters are not especially anxious to figure in the market at the present time, most of them being well covered for the quarter. The Carnegie Steel Co. has blown in a stack at Duquesne, and is now operating 31 out of 59 furnaces.

Quieter at Buffalo

Buffalo, July 14.—Very little inquiry is reported by the furnaces in the Buffalo district. The market is quieter, with no definite improvement noted in the foundry trade, using iron purchases or inquiries as a gage. Some small orders have been booked for amounts of 200 to 500 tons each, principally for foundry grades. The disposition of the furnace interests of Buffalo is to hold firmly for $13 as a minimum on any grade; selling below the quoted schedule having apparently ceased. For last quarter an advance of 25c per ton is being asked and one interest is beginning to ask from 25c to 50c per ton more per ton on the higher silicon irons.

The Tonawanda Steel & Iron Co. blew out its furnace B and put into commission its furnace A.

Fair Sales at Cleveland

Cleveland, July 14.—One Cleveland firm sold 6,500 tons of various grades of pig iron during the past week for delivery from a lake furnace. There is a slight increase in interest on the part of foundrymen, but buying in this city is light. The reduction of the pig iron rate from Birmingham to Cleveland, 35 cents, making the rate $4, has aroused very little comment in this city, as the tonnage of southern pig iron sold in Cleveland is not large and the foundries which prefer the high phosphorus southern pig iron are likely to use it even when the price of the southern product is higher than that of the northern.

Foundry Demand Continues

Chicago, July 15.—Inquiry and resulting sales of foundry iron continue brisker than for some time and each week brings a larger tonnage. Inquiries in lots from 500 to 2,000 tons are before the trade in considerable volume and orders are resulting each day.

Northern No. 2 foundry and malleable are being held at $14, Chicago furnace, and tonnages for last half are going at that level. Inquiries for delivery into next year are being met by a higher quotation and buyers apparently are slow to engage themselves that far ahead at the prices asked.

Basic iron has come into the limelight again by the purchase of 10,000 tons of standard basic for immediate delivery from a Chicago steel maker at the lowest price made recently. The tonnage is for the Commonwealth Steel Co., Granite City, and the price is said to have been $14.25, delivered, equal to $12.75, Chicago furnace. This makes a total of 34,000 tons of basic taken by this consumer in recent weeks.

Southern iron continues to be quoted at $14.60, delivered in Chicago, and lower prices than this appear to have been withdrawn.

Alabama high silicon iron, 5 per cent, is obtainable here now at $16.35, delivered, a trifle lower than the price recently prevailing.

Basic Sale at St. Louis

St. Louis, July 13.—There is a much better feeling in the pig iron market at St. Louis. One sale was made Friday of 10,000 tons of northern basic and another one today of 300 tons of southern No. 2. Inquiries in the market are: 500 tons Lake Superior charcoal iron, 500 tons of northern coke iron and 100 tons of northern coke iron. Prices continue low, southern No. 2 being freely quoted at $10.25, Birmingham; northern iron at $14, Chicago furnaces, and at $13 to $13.50, Ironton.

Firmer in the South

Birmingham, July 11.—Pig iron sales at Birmingham during the week probably did not total over 6,000 or 7,000 tons. Some large inquiry is reported, however, and furnace men are hopeful of placing good orders soon. Iron makers state no more iron is being sold for $10. That price was quoted on some of the sales made in the past couple of weeks, but they insist that they are refusing offers of $10 for Southern No. 2 and demand $10.25 for spot and third quarter delivery and $10.50 for fourth quarter.

Some of the larger inquiries being made include requests for prices on lots of 5,000, 10,000 and one for 20,000 tons. The Southern railway is asking for quotations on an order of 37,000 tons of rails, but Birmingham rail men say they have no idea where the order is to be placed or how soon it will be placed.

(For complete prices see page 142.)

Billet Orders

For Immediate Needs—Contract for Sheet Bars

Philadelphia, July 17.—Billet buyers in the east show little inclination to make contracts and are placing orders for immediate needs. The business of this character taken by eastern Pennsylvania mills is heavier. The market, however, is by no means active. A Lebanon consumer is in the market for 600 tons of high sulphur billets. Eastern makers are holding to $21.90, Philadelphia, or $19.50, Pittsburgh, for rolling billets and about $25.90 for forging steel.

Closes Sheet Bar Contract

New York, July 13.—The Lalance & Grosjean Mfg. Co., New York, has placed with Pittsburgh makers a yearly contract for 18,000 tons of sheet bars, to be made at the rate of 1,500 tons monthly. The settlement price under this contract will be based upon average monthly quotations in The Iron Trade Review. A New York iron and steel merchant recently inquired for a price on 25,000 tons of steel skelp, for shipment over an extended period, but, as far as known, this business has not been placed.

Semi-Finished Quiet

Pittsburgh, July 14.—The market for billets and sheet bars is quiet, although some contracts have been quietly closed for future delivery. A short time ago a fairly heavy tonnage of sheet bars was offered at what was reported at $19, delivered, but it since has been learned from a reliable source that the tonnage consisted largely of a miscellaneous lot of material. The sale of these sheet bars would not affect the general market, which is quotable at a range from $20 to $20.50, mill. Billets are unchanged in position.

Will Resume Operations

Ashland, Ky., July 13.—Wire rods and billets are very quiet and there is no change in the situation. The Ashland Steel Co., of this city, is still closed for mid-summer alterations and repairs, but will re-open on July 20 in all departments. Wire rods are quoted at $25 and billets at $20, both Ashland basis.

The Hooven-Owens-Rentschler Co., Hamilton, O., has declared a quarterly dividend of 1½ per cent on its prefered stock.

Heavy Plate Tonnages

Will be Required for Battleships—Demand for Prompt Delivery of Boiler Plates

New York, July 13.—Eastern ship yards expect that the three new dreadnoughts for the government will be out for figures in the near future. Each of these vessels will require about 14,000 tons of steel, apart from the armor plate. Two of them will be built in private yards and one in government yards. The plate market about New York shows no important activity and remains quiet. Despite some reports of shading of this figure, an attractive lot of several hundred tons of prompt plates was placed with a Pittsburgh mill upon the basis of 1.10c, Pittsburgh. The range of the market for prompt and forward delivery is 1.26c to 1.31c, delivered, or 1.10c to 1.15c, Pittsburgh.

Eastern Plates Are Listless

Philadelphia, July 14.—Plate makers in eastern Pennsylvania find little cause for encouragement in the present listless condition of their market. They continue to obtain their business largely from small orders, but the tonnage is not increasing and mill operations are kept reduced. Larger requirements before eastern mills are scarce. Makers in eastern Pennsylvania are not making contracts except where they cannot avoid it, and the usual price is 1.15c, for third quarter or beyond. Prompt plates are selling easily at 1.25c, Philadelphia, or 1.10c, Pittsburgh, and this figure has been shaded at times.

Plate Makers More Cheerful

Pittsburgh, July 14.—Leading manufacturers of steel plates in this vicinity report better demand for this product, and expressions are heard that the market occupies a more substantial position than it did several weeks ago. Scattering inquiries have come out in moderately better volume, and specifications are coming in at about the same rate as they did in June. Prices are no better, however, and veteran manufacturers say they do not expect to see any change in the price situation until autumn. Mill operations have not been increased.

Prompt Delivery Demanded

Cleveland, July 14.—Although it is admitted that 1.10c, Pittsburgh, has been shaded on tank plates in this territory, the usual quotation is 1.10c. An encouraging feature of the market, especially for boiler plates, is that the buyers almost invariably insist upon prompt delivery. This indicates that stocks are low.

Feeling Better at Chicago

Chicago, July 14.—Plates, in common with other finished steel products, show a better sentiment. Quotations of 1.28c, Chicago, are better maintained and the buyer has less influence over the market than formerly. Tonnages of steel are being specified more freely, though the effect on prices so far has been merely to stiffen the existing range.

One interest in this territory reports its June tonnage a small percentage below February, which was the best month of the present calendar year, and three times the tonnage booked in May, the slackest month of the year.

Plates are moving on a basis of 1.28c to 1.33c, Chicago, though there continues some buying of preferred tonnages at 1.25c, Chicago, but in lessening degree.

Sheet Specifications

Show More Improvement in the East—Prices Apparently Strike Bottom

Philadelphia, July 14.—The run of sheet business with eastern Pennsylvania makers is a little more favorable as buyers now are placing more contracts, especially for third quarter and appear satisfied that the price of 1.50c, Philadelphia, or 1.35c, Pittsburgh, for No. 10 gage blue annealed is not likely to recede much further. Specifications are in slightly better volume. Eastern makers have accumulated some backlog of orders as a result of their shut down over the Fourth.

Sheet Demand Improves.

Pittsburgh, July 14.—More important makers of steel sheets in this territory say inquiry has come out in slightly better volume the last 10 days, and some consumers show a disposition to buy for extended delivery. A number of attractive tonnages have been placed. Prices are unchanged.

Low Sheet Prices

Cleveland, July 14.—For some time past competition on sheets in the Cleveland district has been extremely keen and has brought out some very low quotations. It is now believed that bottom prices have been reached.

Sheets at a Standstill

Chicago, July 14.—Steel sheets appear to be marking time on the turn of the market and quotations are practically the same as have ruled for a fortnight. Somewhat better tonnage has been offering and specifications are a shade better, but not sufficient impetus has been received to make prices stronger.

Some interests have found their mills sufficiently booked to allow them to retire from competition at present prices and await better things when their books again show hunger for orders, hoping this will be at a time when prices have advanced.

Black sheets, No. 28 gage, are quoted at 1.98c to 2.03c, Chicago mill, and galvanized at 2.88c to 2.93c, Chicago mill.

Decreased Demand

Cincinnati, July 14.—Sheet mills in this territory are booking very little business and some are operating on about half schedule. One large mill is still closed, but will resume operations in the near future. Orders are limited to small tonnages. Galvanized sheets No. 28 gage are being sold at from 2.85c to 2.95c, black sheets No. 28 at from 1.90c to 2c, and blue annealed No. 10 gage at from 1.50c to 1.55c, all Cincinnati basis.

Ferro Inquiry from Chicago

New York, July 13.—A Chicago buyer has put out a formal inquiry for 200 tons of ferro-manganese. Beyond this negotiation, there is very little interest shown by consumers in this alloy. German makers continue to do little at their recent reduced price of $37.00, seaboard, and English makers likewise are booking practically nothing but carloads at $38.00, seaboard.

Alloys Quiet at Pittsburgh

Pittsburgh, July 14.—Demand for ferro alloys in western Pennsylvania and eastern Ohio is light, and quotations continue somewhat irregular and uncertain. Not enough tonnage has been sold recently to offer any insight into the actual situation.

(*For complete prices see page* 142.)

Contract for Axle Bars

And Spring Steel Placed by Wilkesbarre Company—Close Figuring by Implement Makers

Philadelphia, July 14.—The Sheldon Axle Co., Wilkesbarre, has terminated negotiations of several weeks by placing a contract for axle bars and spring steel, the maximum requirements of which are 30,000 tons for the year from July 1. The business was divided between two Pittsburgh makers. Additional steel bar contracts are being taken in this district, one seller entering a total of 3,000 tons for last half at 1.30c, delivered, or 1.15c, Pittsburgh, this including lots of 1,500, 1,000 tons and smaller tonnages. Specifications continue better. Prompt shipment bars can be had at 1.25c, Philadelphia, or 1.10c, Pittsburgh.

Large Bar Contracts Closed

New York, July 13.—Some of the largest buyers of steel bars in the district contiguous to New York, apart from the up-state farming implement manufacturers, previously reported as having closed, are covering for their last half and all-year requirements. In the case of one eastern implement buyer, at least, it is learned that 1.10c, base Pittsburgh, was done by a large maker for shipment over the rest of the present year. Some of the smaller buyers also are placing contracts for the present year, at 1.15c, Pittsburgh. This price remains the usual contract figure of the market, with $1 lower going for prompt delivery.

Steel Bars Move Better

Chicago, July 14.—Business in steel bars is improving. Agricultural implement makers are buying gradually, the past five weeks having seen a considerable tonnage from this source. There has been no concerted movement, but a gradual covering that promises to involve the entire trade from this quarter before long.

The quotations on which these sales are going is 1.28c, Chicago, for third quarter, 1.33c for last quarter and 1.38c for first half of next year. Efforts to break down this stand of the mills have not availed and makers are sanguine they will be able to hold it steadily.

Iron Bars Stronger

Chicago, July 14.—Iron bars appear somewhat stronger than before the mills shut down pending settlement of wage agreement with the Amalgamated Association. Tonnage coming in is better than has been the case recently and prices appear somewhat firmer, though makers are not certain they will hold unless specifications continue to improve. Whereas bars have been obtainable as low as 1.00c, this price appears to have disappeared and 1.05c, Chicago, is the minimum generally. The bulk of tonnage now is going at 1.07c, Chicago, with 1.10c, Chicago, for the less desirable business.

The mills of the Republic Iron & Steel Co., the Interstate Iron & Steel Co., and the Joliet Rolling Mill Co. have resumed after being idle from one to two weeks. The Joliet Rolling Mill Co. has become a member of the Western Bar Association and participated in the recent conference in this city.

Some Close Buying

Cleveland, July 14.—Some exceedingly fine figuring is being done by agricultural implement manufacturers on steel bar prices. They are making strenuous efforts to contract up to Jan. 1 at 1.10c, Pittsburgh, and it is possible that some of them may have been able to do it, but the bulk of the business continues to go at 1.10c for specifications up to Oct. 1, 1.15c for delivery up to Jan. 1 and 1.20c for delivery during the first half of next year.

Specifying Improves

Buffalo, July 14.—Better specifying is reported in bar materials by some of the Buffalo mills and agencies. July is holding its own with June and June was ahead of May. All unspecified tonnages, on contracts ending with June 30 are being cancelled by most interests, and on renewals are insisting on monthly quota clause to offset possible taking of tardy specifications towards end of contract period. Prices hold at 1.10c, base, immediate; 1.15c, base, on contract for third quarter requirements.

Eastern Mills Resume

Philadelphia, July 14.—Eastern Pennsylvania iron mills are doing a little better and the puddle mills of the Glasgow Iron Co. and Lessig & Co., both at Paterson, have resumed on muck bar orders after an idleness since April. The eastern bar iron mills are getting a slightly heavier tonnage, but prices for common bars do not improve and hang around 1.17c, Philadelphia or 1.10c, mill.

Cast Iron Pipe Demand

Is Active in South, but Prices Are Low—Leading Company Low on Panama Tonnage

New York, July 13.—Reports from the south indicate a very healthy condition of the cast iron pipe market, as far as volume goes, but prices continue low and the situation is unsatisfactory to producers, as a result. Some of the southern works have been selling freely at $19.50, at their plants for 4's. Considerable selling of pipe for southern foundries is being done in the New York market. For nearby delivery, the pipe situation at New York is not satisfactory, although the tonnage is quite fair. The United States Cast Iron Pipe & Foundry Co. has submitted the lowest bid to the government for the 12,000 tons of pipe for Panama, but this matter has not yet been decided. The United States company will get all or the bulk of the order, although some of it may go to R. D. Wood & Co. The same company has taken from the contractors 830 tons of 8 to 20's for Jersey City and 350 tons of 16's for Plainfield. Prices among eastern Foundries still are low. The Metropolitan Water Board, Boston, has taken bids on 750 tons of 60-inch.

(*For complete prices see page* 142.)

Slow at Chicago

Chicago, July 14.—Cast iron pipe sellers are finding little of interest in present conditions. Routine orders continue to make up the greater part of the tonnage and contract competitions are few. Michigan City, Ind., has opened bids for 700 tons of pipe for submarine work but the award has not been made. Casper, Wyoming, will open bids July 20 for 1,200 tons of four to 12-inch water pipe.

Shafting Prices Irregular

Pittsburgh, July 14.—With heaviest consumers under contract for immediate needs, the market for cold rolled shafting in this section of the country is decidedly dull, and, in some respects, conditions are not so satisfactory as 30 days ago. Although some makers still quote 66 off for future delivery, the 67 per cent off quotation is more frequent than previously.

Scrap Improves Slightly

In Eastern Pennsylvania, but Demand in Nearly All Centers is Extremely Light

Philadelphia, July 14. — Underlying conditions in the eastern Pennsylvania scrap market are a little more promising and there seems to be slightly more stir among buyers, though the latter, as a rule, have not reached a closing point. What business is being done is largely for early shipment, as dealers are not inclined to sell ahead. The anomaly is presented in heavy steel that while the consuming situation is a little better, quotable prices are a trifle weaker, $12.50, delivered, being accepted by dealers for odd lots for quick delivery. This is explained by the fact that the dealers have about shipped out their orders with the mills and in the absence of consumptive buying, are disposing of pressing lots to one another. The lower prices are being made chiefly in sales between dealers. There has been some buying of No. 1 railroad wrought at $12, delivered, or 50 cents lower. Stove plate also is lower.

Few Sales at New York

New York, July 13.—The same difficulty of doing business under prevailing market conditions maintains in old material at New York and few sales are being made. Where consumers are making offers and this is only in a limited number of cases, these figures are too low to induce holders to part with material and as the buyers have no pressing needs, they are indifferent whether or not they get acceptances. One eastern Pennsylvania steel maker is offering $10, delivered, for heavy melting steel, which is probably 50 to 75 cents below the market. One broker is offering $11, Pittsburgh, for steel. Many grades are wholly inactive and nominal in price. Between 1,500 and 2,000 tons of scrap from New York buildings about to be demolished are in the market.

Scrap Sluggish

Pittsburgh, July 14.—The iron and steel scrap market in western Pennsylvania and eastern Ohio continues sluggish, resembling the pig iron market in some respects. Consumers covered needs a few weeks ago, and show no interest in the market at present. Quotations are about the same as a week ago.

Sales Are Few

Buffalo, July 14.—The Buffalo market continues practically featureless. Sales few and far between and inquiry slight. Dealers are holding off, not caring to make further concessions to secure business. Prices remain the same. There is a ripple of trading in heavy melting steel and turnings and borings, with some inquiry for old iron axles and old steel axles.

July Falls Behind June

Cleveland, July 14.—July business in the Cleveland iron and steel scrap market is not up to the record of June, which was far from satisfactory. Embargoes at two large Youngstown mills and refusals to accept shipments by a number of others are exerting a deadening effect. One of the two leading consumers of heavy melting scrap in this district is out of the market; the other is offering $10, gross ton, delivered mill, for high grades of shop steel, but is obtaining little at this figure. Dealers still are willing to pay as high as $10.50, so a range of $10 to $10.50 may be quoted.

Somewhat Weaker at Chicago

Chicago, July 14.—Scrap iron and steel is somewhat weaker and several items are obtainable at 25 to 50 cents per ton less than previous quotations. Closing of several iron bar mills during the past fortnight has had its effect on the market and as mills generally are stocked fully, future demand offers little encouragement.

Railroad offerings are as follows: Southern Railway, 5,000 tons; Soo Line, 600 tons; Northern Pacific, 1,500 tons; Santa Fe, 2,600 tons; C., P. & St. L., 200 tons.

Lists at St. Louis

St. Louis, July 14.—Scrap iron lists out in the St. Louis market are: Southern Railway, 4,500 tons, closing July 15, and Mobile & Ohio, 60 tons, closing July 17. Prices are tending to an advance, but we continue to quote same as last week.

Decline in Prices

Cincinnati, July 14.—The scrap market is at a standstill and the tonnage moved last week was far below that of any week in June. Embargoes have been declared against shipment to several mills and other melters are withholding shipments. Bundled sheet scrap and heavy turnings have been reduced 25 cents per ton during the past week and are now given at $4 to $4.50 for the former and from $5 to $5.50 for the latter, both per net ton. No. 1 machine cast has fallen off 50 cents per ton and is now quoted at from $8.50 to $9 per ton. Other prices are unchanged. Demand is mostly for scattering orders which are usually very small in size.

(*For complete prices see page* 142.)

Coke Market

Shows Some Signs of Weakness—Foundries Still Contracting

Pittsburgh, July 14.—The Connellsville coke market is struggling to hold its own, and has succeeded thus far in so doing. Talk of contract furnace fuel being offered at $1.75, ovens, is heard, although leading dealers say they would not sell at that figure; some operators are quoting $2, ovens. The foundry coke market is unchanged, but shows a tendency toward weakness, especially for spot shipment. The *Connellsville Courier*, for the week ending July 4, says production was 259,252 tons, a decrease of 2,301 tons, indicating that the holiday had scarcely any effect upon operations.

Foundries Still Contracting

Cleveland, July 14.—Contracting for coke by Cleveland foundries is not as active as it was during the preceding three weeks, but some foundries are covering for their requirements. Those contracting for the last half and those covering for the full year are about equally divided.

Inactive at St. Louis

St. Louis, July 14.—There is no activity in the coke market at St. Louis, and prices are unchanged as follows: Connellville 27-hour foundry grades, $2.50, ovens, and 48-hour furnace at $2 to $2.25, ovens.

Wire Prices Unchanged

Chicago, July 14.—Rumors of an advance of $1 per ton in wire and wire products have not been borne out and no interest here has altered the schedule. Mid-summer dullness prevails and nothing is happening to change conditions, demand remaining unchanged.

No Change in Wire Products

Pittsburgh, July 14.—Talk of an advance in wire products was heard last week, but manufacturers have made no announcement of a change in prices, and expressions are heard that the situation will be unchanged until fall buying begins. The market continues dull.

The plant of the Oliver Plow Works, South Bend, Ind., resumed full operations July 6.

June Contracts Dropped

In the Structural Market, but There was a Gain in Building Permits

New York, July 13.—Structural lettings in the country during the month of June slightly fell away from the record of the preceding month, according to reports collected by the Bridge Builders' and Structural Society, and announced at the meeting held at New York, July 10. The statistics of the secretary of the society showed that during June, 56½ per cent of the entire capacity of the bridge and structural shops of the country was contracted for. This compares with 57 per cent in May, 88 per cent in April and 76 per cent in March. Structural awards in New York and vicinity are running at about normal rate for this time of the year and the general tonnage is better than a few weeks ago, chiefly in the way of small work. The active tonnage at this time makes a good showing, due to several large contracts, including 9,000 tons for the subway terminals at Newark, and about 10,000 tons of additional subway and elevated work in the metropolis. Fabricated prices are low, apartment construction going at about $50 a ton, erected, and it is believed that on some of the large work, now pending, this figure will be shaded. Plain material prices continue at 1.26c to 1.31c, New York, or at 1.10c to 1.15c, Pittsburgh.

Placing Orders for Stocks

Philadelphia, July 14.—About the only encouraging sign that structural shape makers have seen in this territory has been the placing with eastern mills of some good-sized orders for stock, some of them over 1,000 tons. Miscellaneous orders with eastern mills, which have been fair, have dropped off and action is coming slowly on the few larger prospects now up in this district. The 1.25c, Philadelphia, or 1.10c, Pittsburgh, price on shapes which has been available for some time, now appears more easily obtainable, and it is reported this level has been cut to 1.22½c, Philadelphia, in some cases.

Proposed Cleveland Buildings

Cleveland, July 14.—The Crowell-Lundoff-Little Co., general contractor for the Bingham warehouse, calling for about 1,600 tons of shapes and 2,100 tons of bars, is receiving bids under the redrawn design for the building. The contract for shapes and bars will probably not be awarded for two or three weeks. Other new construction which is being considered includes the New England building addition, the Union National Bank building, the East Ohio Gas Co. building and the addition to the Colonial hotel. On none of these buildings has the tonnage of steel been announced.

Structural Inquiries Better

Pittsburgh, July 14.—Fabricators in this territory say inquiries have come out in better volume the last couple of weeks, although no particularly attractive orders have been placed. Several projects, including a bridge, are under consideration in this section of the state.

More Moving at Chicago

Chicago, July 14.—About 4,000 tons of structurals were contracted in this market the past week, involving a dozen projects, mostly small. The far west was less in evidence than usual, most of the contracts being in the Mississippi valley, though the largest single tonnage was a public pier in San Francisco, which is to be reinforced concrete, taking a tonnage of 1,500 tons in reinforcement bars.

Large Bridge Planned

County Engineer J. G. Chalfant, Allegheny county, Pa., has been directed to prepare plans for an 1,100-foot span bridge over the Ohio river, connecting the Lower North Side, Pittsburgh, with McKees Rocks, Pa. The structure will be one of the largest in the Pittsburgh district, but it is not known how much steel will be involved.

Gain in Building Permits.

Dun's Review states that building permits issued in June make a satisfactory comparison with those of the same month last year. The total granted at 75 leading centers in the United States call for an expenditure of $72,740,000 against $68,972,000, a gain of 5.5 per cent. In New York City, new construction foots up $14,256,000, an increase of 29.2 per cent. Among the cities making the best showing are the following, the percentage indicating the increase over June of last year in each case: Baltimore, 151.1 per cent; Chicago 29.3; Cleveland, 73.4; Columbus, 21.6; Kansas City, 80.4; Hartford, 97.6; St. Paul, 84.8; Seattle, 48.9; Toledo, 118.1; Wilkes Barre, 365.9, and Worcester, 38.1. There were losses at Houston of 57.7 per cent; Los Angeles, 30.5; Minneapolis, 11.3; Newark, 46.2; Philadelphia, 9.8; Pittsburgh, 34.7.

Contract for Station.

Toronto, July 14. — The contract for the construction of a new union railway station in Toronto has been awarded by the Toronto Railway Terminal Co. to the P. Lyall & Sons Construction Co., Montreal, the estimated cost of the work being about $3,500,000. Construction will commence about Jan. 1 next, and the work is to be completed not later than July 1, 1916.

CONTRACTS PLACED.

Davis Theater building, Pittsburgh, 300 tons, awarded Riter-Conley Mfg. Co.

State board of harbor commissioners, pier No. 35, San Francisco, 1,500 tons, to Healy-Tibbitts, reinforced concrete.

David Stott, store building, Detroit, 752 tons, to American Bridge Co.

Hangers and expansion joints for Colfax-Larimer viaduct, Denver, 300 tons, to Omaha Structural Steel Co.

Elks' National Home, Bedford City, Va., 239 tons, to Virginia Bridge & Iron Co.

CONTRACTS PENDING.

Taber Pump Co., Buffalo, new foundry and shop, requiring 200 tons structural, bids called for.

New Y. M. C. A., Rochester, bids in Thursday, requiring 900 tons steel.

Hippodrome, Youngstown, 500 tons, bids submitted.

Third tracking of Broadway elevated line, Brooklyn, for New York Municipal railways, 5,000 tons. Bids to be received July 17.

Subway terminal, Newark, N. J., 9,350 tons. Bids taken on general contract but award not yet announced.

Four apartment houses, New York City, for Bing & Bing, 2,000 tons; bids about to be asked.

Hall loft, West 134th street, New York City, 800 tons; bids being taken.

Arkansas Inquiry Not Closed

Pittsburgh, July 14.—Negotiations for 54 miles of 16-inch line pipe, involving about 7,000 tons, for Arkansas gas fields have not yet been closed. Inquiries for between 18 and 20 miles of 3, 4 and 6-inch pipe for shipment to West Virginia have been sent out. The market for boiler tubes continues irregular.

Government Contract

Philadelphia, July 14.—The Republic Iron & Steel Co. has been awarded by the government 600 to 700 tons of merchant pipe for quick delivery to various navy yards.

The Mark Iron & Steel Works, Wengren-Ruhr, Germany, manufacturers of carbonless metals and alloys, have appointed C. W. Leavitt & Co., 30 Church street, New York, as their selling agents.

(*For complete prices see page* 142.)

Inquiries for 10,000 Cars

Now Pending and the Car Market is More Encouraging Rail Market Quiet

New York, July 13.—Active inquiries for freight cars, now in the market, total about 10,000. The pending list was swelled in the week by the appearance of the formal inquiry of the Southern Pacific railroad, which previously had been discussed. This called for about 4,600 cars and is one of the largest issued for some time, being divided into 2,600 box, 850 stock, 400 flat, 250 gondola, 330 tank, 20 cabooses and 150 flat car bodies. The Erie railroad is calling for new specifications on a recent inquiry for 800 gondolas. The Baltimore & Ohio railroad has awarded the repairing of 2,000 box cars to the Ryan Car Co., Chicago. The car market generally has a better outlook, but the difficulty of the railroads in financing their requirements still is the principal factor holding back a further increase in equipment buying, according to builders.

The rail market remains rather quiet. The principal negotiations are those for the Southern Railway, for the Clover Leaf and for some smaller lots.

The steel works and rail mill of the Maryland Steel Co., which have been idle for some weeks, are resuming this week principally upon the Pennsylvania railroad order.

The Chesapeake & Ohio railroad has placed 2,000 kegs of spikes with a Richmond maker. The Baltimore & Ohio railroad has released a specification for 4,000 kegs to Pittsburgh makers.

Missouri Pacific Order

Birmingham, July 14.—An order for 4,700 tons of rails has been placed with the Tennessee Coal, Iron & Railroad Co. by the Missouri Pacific Railroad company. The Ensley plant of the Tennessee company is now operating on a 60 per cent capacity basis and it is stated that no further cessation of activity will take place during the summer.

Working Full Capacity.

Toronto, July 14.—The Canadian Car & Foundry Co. has secured extensive orders for rolling stock for the equipment of the Canadian Northern Railway. The amount involved is stated to be about $750,000. The passenger car plant of the company is now working to full capacity.

The Green Bay & Western railroad has ordered one superheater freight locomotive from the American Locomotive Co.

Holding Up

Is Warehouse Business in New York —Busy at Chicago

New York, July 13.—The larger warehouse interests in New York City report that their business at the present time is holding up well to the recent improved rate. There appears to be a mixed condition, however, among jobbers as other companies not so large are unable to see much encouragement in the situation.

Declines at Cincinnati

Cincinnati, July 14.—Warehouse business has dropped off a little during the past week and orders taken during this time show a decrease in comparison with those of the first week of the month. Demand has been mostly for building materials and the local carpenters' strike which has existed here for about two months has seriously handicapped building operations. One local concern is still offering hoops at 1.80c, although other houses are holding at about 2c for this material. No changes in prices are reported.

Chicago Warehouses Still Busy

Chicago, July 14.—Warehousemen report demand for structural material continues, as contractors seek to make up for the delay caused early in the season. Other lines are doing better and business is more satisfactory than has been the case since early in the year.

Depression

Felt Keenly in the Great Lakes — Early Improvement Not Expected

Conservative interests are not now expecting any improvement in the ore trade until September. Furnacemen that have placed orders are reluctant to have the ore forwarded and sales in general have been slight. The ore trade at present is suffering its deepest depression and vessel after vessel is leaving the head of the lakes without cargo. There is not enough ore moving to keep the vessels owned by the shippers employed, while rains on the ranges have checked the movement of the shipping docks. The July movement is not expected to be appreciably better than that of June, and it is certain now that the brunt of the whole trade will be thrown upon the fall months.

(*For complete prices see page* 142.)

METAL MARKETS

New York

July 14.

Copper.—The improvement in demand for refined copper which was reported last week, has been succeeded by a condition of apathy on the part of consumers, who, evidently being supplied with their requirements for a month or two in the future, are not at present interested in the market. The leading selling agencies have not yet reduced their asking price of 14.87½c, delivered 30 days, but second sellers now are making offers of 13.75c, delivered 30 days, and less. On a wholesale contract basis, electrolytic may be quoted at 13.50c to 13.55c, cash, New York; prime lake copper may be quoted nominally at 13.75c, delivered 30 days, or 13.60c to 13.65c, cash, New York. The last report of the Copper Producers' Association distinctly was unsatisfactory from the producers' standpoint, showing a total increase in stocks during June of 22,768,022 pounds. The report, which was issued July 8, showed stocks, as of June 30, to be 106,110,663 pounds. The London market fluctuated within narrow limits during the week with a declining tendency at the close.

Tin.—The wide fluctuations in the price of Straits tin have had the effect of making both buyers and sellers shy. Today, the asking price is 31.62½c for spot July and August, while each succeeding month is held ⅛c higher. The close on the London exchange today was £143 5s for spot and £144 15s for three months, a decline of £3 from yesterday.

Lead.—The leading producer continues to ask 3.90c, New York, and this price continues to be met in the east by independent producers. In St. Louis, however, the market continues comparatively lower, there being numerous sellers at 3.75c, St. Louis. A good demand was reported the latter part of last week and the feeling is better.

Antimony.—This market is almost a minus quantity and the metal continues absolutely without support. Cookson's continues to be held at 7c to 7.12½c; Hallett's and United States at 6.75c to 6.85c and the other brands at 5.50c to 5.62½c. These prices are on the basis of duty paid, New York, for large lots.

Aluminum.—This is the most active of the metals at present. Some good-sized contracts for delivery over second half have been placed and there also has been some fair buying of spot. A good part of this business went to sellers of foreign aluminum, who are asking about the same price as the domestic producer. Spot aluminum, 98 to 99 per cent pure, now is obtainable at 17.25c to 17.50c, duty paid, New York.

Chicago

New Metals Inactive.

Chicago, July 14.—New metals are not in great demand at this time and the market is slow, following the trend of other centers. Copper and tin range a shade higher in consonance with other markets.

We quote dealers' selling prices f. o. b., Chicago, as follows:

Lake copper, carload lots, 13.35c; casting, 13.75c; smaller lots, ¼c to ¾c higher. Spelter, car lots, 4.90c; lead, desilverized, 3.80c; sheet zinc, $7.00, f. o. b. La Salle, in car lots of 600-pound casks; pig tin, 33.00c; Cookson's antimony, 7.12½c; other grades, 5.65c.

Dullness Rules British Market

Prices Remain Firm as Stocks Drop to Low Figure—Conditions Quiet in France and Belgium—German Plate Manufacturers Form Syndicate

Office of The Iron Trade Review,
Prince's Chambers, Corporation St.,
Birmingham, Eng., July 4.

All branches of the pig iron industry are extremely dull, the only hopeful sign being the great firmness of prices. Although little business has been transacted in Cleveland during the week, quotations have fallen by only about 2d (4 cents). This, of course, means selling figures are close to or below the cost line, and the point has been reached when makers are obliged to adopt the "take-it-or-leave-it" attitude. A significant event is the stoppage of some furnaces at Netherton, South Staffordshire, owned by Messrs. Pearson. The firm, which employs about 50 men, no longer can make iron at a profit, and it has stopped production for the present. These furnaces, however, merely have damped down and not blown out. Mr. Pearson, the chief proprietor, states that it is 40 years since the furnaces have had to stop through shortness of work. The stoppage is partly attributed to the refusal of the men to make any concessions.

Several pig iron producers in Staffordshire are curtailing output, with the result that supplies will be reduced by about 1,000 tons per week. Some of the furnaces have a fair amount of stocks, which will be cleaned out before recommencement is considered. East coast hematite is being pressed on the market at 59s 3d ($14.50) for any delivery. In all directions there is a strong determination not to pile up stocks.

The position with regard to finished iron and steel is interesting because of the quarterly meetings which are due next week. The outlook for this event is not particularly cheerful; but several firms report better specifications and rather more new business, so they are in a better position to maintain quotations. It is expected marked bars will maintain the present quotation of £8 10s ($40.80). This is quite £2 ($9.78) above the selling price of unmarked iron, considered an excessive difference, but there is no necessity to reduce best bars in view of the steady demand, especially for engineering and rolling stock purposes. There is hardly a mill or forge throughout Staffordshire which has not been partially laid off by the great heat.

Finished iron prices are finely cut. This applies especially to gas strip, which is now without the support of the Gas Strip Association. The Staffordshire makers have brought their prices down to £6 5s ($32), which they describe as an unprofitable selling figure, but even at this price they are beaten by Belgian competition. Galvanized sheets are in rather better demand, and a large output is being maintained. Leading firms refuse less than £10 15s ($51.60), and some demand £11 ($52.80), but smaller makers go very materially below this figure in their quotations. The steel trade continues in an unsatisfactory condition, but some improvement is reported from Barrow, where the rail mills and plate mills are well employed. The tin plate market continues depressed, and prices are tending downward on account of the competition for orders and the weakness of raw material, but there are brighter spots here and there, and some tin plate works are booked to the end of the year.

French Iron Trade

Paris, June 24.

The French market still shows no signs of life. The crisis is particularly notable in the iron ore market and the producers in the Briey Basin have been obliged to reduce their output by 25 to 30 per cent. They could not avoid a considerable reduction in price. The business in Briey ores of good average quality has recently been done in Germany and Belgium at 95 cents per ton from the mine, and part at even less money. In Normandy and the Pyrennes, the decline in the price of ore amounted to about 38 cents, whilst the French iron ore mines of Algeria and Tunis are obliged to suffer a still greater reduction. This is largely the result of an over-production. Respecting crude iron, the smelters have been able to stand out against reduced prices excepting for deliveries to the end of the year; because stocks, particularly in the East French works, have become inconveniently heavy. The same applies to crude steel. In the finished iron market there has been observed for a long time a considerable reduction in output; nevertheless bar iron and plates have to be sold at lower prices. Good average prices for soft and wrought bar iron in the east are $25.65 to $26.60. Some few transactions have gone through at $24.70. Special bar iron is quoted $35.15 to $36.10, but is frequently sold at less money. The basic price for 3-millimeter sheets is $33.25 to $35.15; but business is currently done at less than $34.20, the average price. Girders stand at $36.10 to $37.05. In all the trades producing the above there is a scarcity of work, for only the constructional plants and some branches of wire business which are occupied in providing electrical machinery makers, etc., are fairly occupied.

Belgian Iron Trade

Brussels, June 24.

The heavy metallurgy situation in Belgium is still far from satisfactory, particularly regarding exportation, and prices are falling back gradually to the old levels. Thus we find steel bars held with difficulty at $19.96, with $20.93 to $21.17 for iron bars. Rods are even weaker at about $22.63, and plates ¼ inch thick and more are hard to keep at their quotation of $22.88 to $23.12, whilst ⅛ to 1/16 inch thickness make $23.37 to $24.34. Girders remain unchanged at $25.56 officially, and sheets are maintained unchanged at $28.24. Inland steel bars are dealt in at $2.13¾; iron at $2.23¼ to $2.28; rods at $2.23¼ to $2.28, and heavy steel plates at $2.32¾ to $2.37½; whilst the price, still inland, for girders is maintained with difficulty at the old level of $2.99¼ for a fresh period of several months.

German Iron Trade

Berlin, June 24.

The first meeting of the German light steel plate producers in connection with the scheme for the syndication of finished steel products has just been held at Dusseldorf. Almost every firm was represented. Several committees were appointed to deal more fully with various matters. It was agreed to take the actual sales during any 12 consecutive months in the last two years as the basis on which to fix output allotments. It is intended to include both the home and export trade in the convention. The conference called to discuss the formation of a tube syndicate has

been postponed twice, and it is now stated that the Thyssen interests refuse to consider the matter until the syndication of wire, bars and plates has been definitely agreed upon. It is considered impossible to proceed without the inclusion of the Thyssen interests.

The third conference in connection with the syndication of heavy plates has failed to yield any definite result.

Russian Iron Trade

St. Petersburg, June 23.

The position for roofing iron at Moscow is strong. The largest Urals works are idle on account of a strike amongst the workmen who are objecting to certain conditions in the sickness insurance scheme. The labor disorganization, etc., is such that the "Krovlya", the roofing iron combination, has failed even to deliver goods due as far back as February and March to the country councils. The position at the moment is very difficult.

The production of iron ore in the Kertch district in 1913 amounted to 29,200,000 poods, or an increase of over 4,000,000 poods, or 16.2 per cent over the production of 1912. This is a record production of the district, the previous highest having been as far back as 1901, after which the local iron industry fell away and the activity of the mines has only now been revived in response to the great demand in the country for crude iron.

Reline Brooke Furnace

Reading, Pa., July 11.—No. 3 blast furnace of the E. & G. Brooke Iron Co. at Birdsboro is being relined and as soon as the repairs have been made may be put in operation. A new crusher is also being erected to handle the ore from the French Creek mines, which are soon to be put in operation. Their product will not be sufficient to supply the Birdsboro furnaces and some will be brought from other places.

Eight additional puddling furnaces of the George B. Lessig Co. were put in operation Monday morning. Eight furnaces were being operated.

Nearly all departments of the Reading Iron Co. were idle last week to improve and clean up the machinery. They resumed on Monday.

The Clinton Wire Cloth Co., Clinton, Mass., is to build an addition one story, 86 x 91 feet, of brick and reinforced concrete. The new building will be used by the galvanizing department.

Agree on Scale

Bar Iron Association and Amalgamated Effect Compromise

Representatives of the Western Bar Iron Association and of the Amalgamated Association of Iron, Steel and Tin Workers, in session last week at Chicago agreed on the wage scale for the next year, ending July 1, 1915. The initial meeting was held at Atlantic City in June and produced no result, being adjourned to Chicago.

The result of this latest conference was in the nature of a compromise and several demands were deferred for consideration next year.

Immediately following the agreement the Amalgamated Association delegates conferred with J. W. Dietrick, general manager of the Republic Iron & Steel Co., who signed the new scale for his company.

The scale the past year has been at the rate of $5.25 per ton for boiling on a 1c card. The Amalgamated asked an increase to $6 per ton, and the final agreement was $5.50 on a 1c card. Comparison of the cards is as follows, the old and new scale over 1.25c being identical:

Card.	1913-14.	1914-15.
1.00c	$5.25	**$5.50**
1.05c	5.40	5.60
1.10c	5.55	5.70
1.15c	5.70	5.80
1.20c	5.85	5.90
1.25c	6.00	6.00
1.30c	6.20	6.20

The Amalgamated Association had asked that on the bar and 12-inch mills the mill pay the hookers, now paid by the roller, an addition of 17.3 per cent to the expense of production on a 1c card. This was withdrawn in conference.

The mill owners had asked a change in classification of scrap, moving the dividing line between light and heavy scrap from 19 gage to 22 gage on new scrap used in busheling on sand bottom. This also was withdrawn.

Advance of 10 per cent on rounds and squares between 3/16 and ½ inch also was waived for the present.

Mills represented in the conference and affected by the scale are the following: Interstate Iron & Steel Co., Chicago; Highland Iron & Steel Co., Chicago and Terre Haute; Joliet Rolling Mill Co., Joliet; Helmbacher Rolling Mill, St. Louis; Ohio Falls Iron Co., New Albany, Ind.; National Rolling Mill Co., Vincennes, Ind.; Texas Rolling Mill Co., Fort Worth, Tex.; Union Rolling Mill Co., Cleveland; Empire Rolling Mill Co., Cleveland; Lake Erie Iron Co., Cleveland; Kansas City Bolt & Nut Co., Kansas City, Mo.; Lockhart Iron & Steel Co., Pittsburgh; Standard Chain Co., Columbus; Railway Steel Spring Co., Detroit; Fort Wayne Rolling Mill Co., Fort Wayne. The Republic Iron & Steel Co. is not a member of the Western Bar Iron Association, but works under the Amalgamated scale in its East Chicago plant.

Names Farrell

As Chairman of the Foreign Trade Council

Alba B. Johnson, president of the Baldwin Locomotive Works, who presided at the recent National Foreign Trade Convention in Washington, has announced the personnel of the Foreign Trade Council created by the resolution of that convention. James A. Farrell, president of the United States Steel Corporation, is named as chairman, and all sections of the country and many branches of industry, transportation and finance are represented among the members.

Outlining the purpose of the council, Mr. Farrell said:

"The next great era in the economic development of the United States will be the extension of our foreign trade and the formation of the Foreign Trade Council is a necessary preparation for this evolution in our business life. By gathering active and representative business men into such a body and co-operating with all elements in our oversea commerce, it is hoped to encourage every practical and sound policy designed to secure for us our share of the trade of the world's markets. The foreign trade of the United States is now valued at four and one-half billion dollars a year, of which two and one-half billion dollars represent exports. This trade has developed largely by reason of our natural resources and the individual enterprise of American industry, but without an American merchant marine, comprehensive national policy or commercial and industrial co-operation. The foreign trade is important as affecting American industrial enterprise and labor at home. On the other hand, it is not large enough to absorb all our manufacturing potentialities."

Peat Society Meeting.—The eighth annual meeting of the American Peat Society will be held at the Commercial Club, Duluth, on Aug. 20, 21 and 22. Among other papers, Prof. Peter Christiansen, of the University of Minnesota, will discuss "The Possibilities of Peat in the Beneficiation and Smelting of Iron Ores". On Friday a trip will be made to the Mesabi iron region and to the peat bog section north of Duluth.

India House

Will be Devoted to the Promotion of Foreign Trade

For the accommodation of those engaged in, or devoted to the development of American foreign trade, a new downtown club at New York has been organized to be known as India House. The name is taken from the traditions of American over-sea commerce in the days when "The Indies" was the generic term for the objective for all venturesome marine enterprises.

At a recent meeting of a number of persons interested in this project, James A. Farrell, president of the United States Steel Corporation, was elected president; J. P. Grace, president of W. R. Grace & Co., treasurer; and Willard Straight, of J. P. Morgan & Co., secretary. Alba B. Johnson, president of Baldwin Locomotive Works, Philadelphia; Edward N. Hurley, president of the Hurley Machine Co., Chicago; and James R. Morse, of the American Trading Co., were elected vice presidents.

The three-story building at No. 1 Hanover Square, long occupied by W. R. Grace & Co., and formerly the New York Cotton Exchange, has been leased, and is now being remodeled and decorated in harmony with the early foreign trading traditions of the United States, which it is the purpose of the club to perpetuate. A notable collection of prints and paintings of old merchant vessels and scenes in the distant ports to which they sailed, will be placed in the club. The membership will be national in character.

The organization committee consists of James A. Farrell, E. P. Thomas, Willard Straight, Charles M. Muchnic, P. A. S. Franklin, E. A. S. Clarke, W. L. Clark, Charles A Schieren Jr., E. V. Douglass, W. L. Saunders, Joshua A. Hatfield, J. P. Grace, W. E. Bemis, Albert H. Wiggin, Charles H. Sabin, Maurice Coster, John Foord, James R. Morse, Robert H. Patchin, E. P. Cronkhite, Martin Egan, Lloyd C. Griscom, Charles E. Jennings, Samuel P. Colt, M. A. Oudin and Elisha F. Williams, all of New York; E. N. Hurley, of Chicago, and Alba B. Johnson and W. D. Simmons, of Philadelphia. The organization will be promptly completed and it is expected that the club will be opened Nov. 15.

The American Steel & Electric Co., New York City, recently was organized for the manufacture of steel and electric specialties, among them being a new and improved gasoline pump and a new type of advertising machine. The company has a plant at 2495 Second avenue, New York City, and down-town headquarters at 130 Fulton street.

Heating Engineers Meet

A large number of members of the American Society of Heating and Ventilating Engineers met in Cleveland between Thursday and Saturday of last week for their 1914 semi-annual convention. Papers bearing on heating and ventilating problems were read and discussed. Two professional sessions were held on Thursday and one each on Friday and Saturday. In an address entitled "The Importance of Proper Perspective", Samuel R. Lewis, of Chicago, president of the society, spoke in part as follows:

"We learned long ago to insulate our bodies partially against cold with warm winter cothing. Have we approached seriously the application of this idea to our buildings? We refine the artificial heating plant, spend time and dollars, skill and genius in developing heat transmitting appliances and fuel consuming devices, with no more than a cursory investigation of the type of construction of the building and with no effort to influence the construction to reduce heat losses."

An interesting entertainment program was provided for the visiting engineers. The ladies in the party were shown over the city in automobiles. The Cleveland committee on arrangements was headed by Frank Phegley. Associated with him were R. S. Mayer, J. H. Bacon Jr., W. M. Kingsbury and F. H. Valentine.

Knapp Resigns

G. F. Knapp, manager of sales of E. N. Breitung & Co., Cleveland, miners and sellers of Lake Superior iron ores, has tendered his resignation. Mr. Knapp opened the office for this firm six years ago, when it started to sell its ore, which had formerly been sold through another agency. Mr. Knapp is a graduate of the Massachusetts Institute of Technology, and after having had extended experience in blast furnace operations, he was in the service of Oglebay, Norton & Co., Cleveland, as an ore salesman for a number of years. He has a large acquaintance among iron and steel men and is a member of the Institute of Mining Engineers, American Iron and Steel Institute and the Lake Superior Mining Institute. He is not at present prepared to announce his plans for the future.

Obituaries

Joseph F. Kilby, 8120 Carnegie avenue, S. E., Cleveland, vice president of the Kilby Mfg. Co., sugar refining machinery, died July 12, at Charity hospital, Cleveland, following an operation performed April 19. Mr. Kilby was born near Heidelburg, Germany, in 1847 and graduated from Heidelburg university, coming to the United States in 1865 at the age of 18 years. He located at Sandusky, O., and later organized the firm of Barney & Kilby, machinists, at that place. Coming to Cleveland in 1888 he organized the Kilby Mfg. Co., of which he was general manager until 1909 when he retired.

William W. Culver, former president of the Wrought Iron Range Co., St. Louis, died at the home of his daughter, Mrs. C. C. Nichols, St. Louis, July 11. He was 80 years of age. Mr. Culver was born near Columbus, O., and was educated in the district schools. He began selling stoves in St. Louis for himself in 1862. He moved to Shawneetown, Ill., in 1865, where the firm of Culver Bros. was established. He moved to Kansas City in 1869, and to Kentucky in 1870, returning to St. Louis in 1874. The Wrought Iron Range Co. was formed in 1880, and he became president, but retired from business after the death of his brothers. He founded the Asbestos Mfg. & Roofing Co. in 1903, of which he was president until 1905.

Will Sell Direct.—The Delaware River Steel Co., operating the Tidewater furnace at Chester, Pa., announces that it is terminating its agency arrangements with Hickman, Williams & Co., and will offer direct to the trade its output of basic, malleable, Bessemer and foundry grades of pig iron. The furnace's sales contract with Hickman, Williams & Co. expires July 15.

Will Reline Stack.—The Alabama Co., formerly the Alabama Consolidated Coal & Iron Co., has announced it will spend $15,000 in relining the furnace of that company at Ironton, near Birmingham. It is stated the furnace will be placed in operation within the next few weeks.

The Driver-Harris Wire Co., Harrison, N. J., has declared a quarterly dividend of 1¾ per cent upon the preferred stock and of 5 per cent upon the common stock, payable July 1.

The Detroit plant of the American Car & Foundry Co., resumed, Monday, with 2,000 men.

Many Points Affected by Decision

Reducing Rates on Pig Iron From Birmingham—Alabama Furnace Men Expect Higher Prices

The action of the Interstate Commerce Commission in reducing rates on pig iron from Birmingham to northern points affects more points of delivery than was realized at the time of the announcement of the decision. The cities named in the decision such as Chicago, Louisville and St. Louis were taken merely as representative points to denote the effect on the different zones. As the second paragraph of the syllabus points out, the present differentials between the southern furnaces are to be maintained as is also the relation of rates now obtaining to the Ohio river to points of Central Freight Association territory, represented by a line from Buffalo to Pittsburgh down to the Ohio river and west to the Mississippi river and to the east. As the rate in Central Freight Association territory was cut 35 cents, the rates to Youngstown, Cleveland and all other points in Ohio and Central Freight Association territory generally were cut, so as to preserve the differential.

Cincinnati Dealers Pleased

Cincinnati, July 14.—The decision of the Interstate Commerce Commission reducing the freight rate on pig iron 35 cents per ton from Birmingham to Cincinnati, was very pleasing to dealers of southern iron in the Cincinnati district. Southern iron has been losing ground for several years in southern Ohio, where it has been thrown in direct competition with northern and southern Ohio grades, the latter two having the advantage of lower freight rates. Many manufacturers in this territory have changed their mixtures in recent years, so that they can use northern iron as well as that manufactured in the south, although formerly they believed that it was necessary for them to use nothing but southern grades. Southern iron today is selling at $10, Birmingham basis, for No. 2 foundry, and southern Ohio No. 2 foundry at $13.50, Ironton basis. With the reduced rates, the former can be brought to Cincinnati for $12.90 per ton, while the latter is being held at $14.70 per ton, or $1.80 more than southern grades. Dealers in southern iron believe that with this advantage, some of the lost ground in the Cincinnati territory can be regained. Since the new rates do not take effect until August 15, pig iron men here are afraid that very little iron will be shipped until that time, as buyers will withhold deliveries until they can secure the advantage of the decrease.

Improved Conditions Expected

Birmingham, Ala., July 13.—Alabama iron makers expect not only an increase in trade volume but a strengthening of prices. They are unwilling to predict just what will be the real effect of the lower freight rates from Birmingham, as ordered by the Interstate Commerce Commission last week, but they are in much better spirits than for months. They believe that the new rates will both increase business and strengthen prices.

Many letters and telegrams of congratulations from iron makers in all parts of Tennessee and Alabama have been received by Vice President J. W. McQueen of the Sloss-Sheffield Steel & Iron Co., who was one of the leading figures in the fight for lower rates and all of the letters breathe a new spirit of optimism for the future.

Some buying has simply got to be done soon, say Birmingham iron men. Buyers have been covering merely for immediate needs for some time past, they state, and very few or none of them are stocked for their operation for the third and fourth quarters. They will have to have some iron pretty soon, and for that reason iron makers expect a strong buying movement to develop almost any day.

Little Effect at Louisville

Louisville, Ky., July 14.—The reduction of the pig iron freight rate between Birmingham and Louisville to $2.65, or 35 cents less than the old rate, has naturally been received very favorably by southern furnaces and dealers, but it will have but very little effect upon the market in the Louisville district. This city is generally considered to be in southern territory, and the only northern iron sold here at the present time is to those melters who need it for their mixtures. In direct competition, however, southern iron has had the prestige for several years. There will always be a little northern iron used in Louisville, as some foundries cannot do without it, but the new rates will bring but very little more tonnage to this city from southern stacks.

Joseph S. Ralston, of the Ralston Steel Car Co., Columbus, in a recent interview, stated that his company is now employing 1,200 men and turning out from 20 to 25 cars a day.

Seek Approval

Of Stockholders for Merger of Wheeling Companies

Wheeling, W. Va., July 14.—Stockholders of the Wheeling Steel & Iron Co. have been issued an official call for a meeting on July 17, at 2 p. m., in the Wheeling offices of the company. They are asked to vote upon the proposal to purchase the stock of the Wheeling Sheet & Tin Plate Co., of which I. M. Scott is president. The stockholders of the Wheeling Sheet & Tin Plate Co. will meet at a date not yet decided to vote formally on the same proposal. But since some of the larger stockholders in both concerns are closely identified, it is believed here the vote of both sets of stockholders will be favorable.

What Plans Contemplate

If this prove correct, then plans will be adopted that call for the election of President I. M. Scott, of the Sheet & Tin Plate company, as president of the Steel & Iron company, and the election of President C. R. Hubbard, of the Steel & Iron company, as chairman of the board. Plans further contemplate the improvement by modern equipment installation of the Steel & Iron works, the building of a modern sheet bar mill, etc. Up to this time the activities of the Steel & Iron company had been confined to the manufacture of skelp, of steel tubing up to 12 inches, merchant pipe and oil well casing, etc. It has two blast furnaces and two mills in the outskirts of Wheeling. It is proposed to make changes that will prove more economical in handling its inter-mill traffic. The Sheet & Tin Plate company has a six-mill plant at Yorkville, O., up the Ohio river from Wheeling, modern in every respect, but it is understood plans contemplate doubling its capacity.

The American Rolling Mill Co., Middletown, O., has declared the regular quarterly dividend of 1½ per cent on the preferred and 3 per cent on the common stock.

MEN OF THE IRON TRADE

Who they are Where they are What they are doing

John C. Neale, assistant general manager of sales and structural engineer for the Carnegie Steel Co. at Pittsburgh, has resigned his position to become president and general manager of the Central Steel Co. which is now building an open-hearth steel plant, blooming mill, etc., at Massillon, O. Mr. Neale's resignation took effect July 15. For 20 years Mr. Neale has been associated with the Carnegie Steel Co. in its structural sales department. Previous to his connection with the Carnegie company, for six years he was an engineer with the Keystone Bridge Co. The Central Steel, which was recently incorporated, will manufacture steel, sheet bars and possibly alloy steel manufacture will be added. Its projectors are identified with the Massillon Rolling Mill Co. and allied enameling and stamping interests. R. E. Bebb, of Canton, will continue to be president of the Massillon Rolling Mill Co., and W. H. Davey continues as manager of the Massillon company. John W. Dix, for 19 years identified with the Carnegie Steel Co., Pittsburgh, has been appointed assistant general manager of sales and structural engineer to succeed Mr. Neale. Mr. Dix was closely associated with Mr. Neale in the Carnegie company. After being graduated from the mechanical engineering department at Cornell, Mr. Dix accepted a position with the Keystone Bridge Works. A short time later he became actively identified with the Carnegie company in its sales and structural engineering departments.

William H. Schulte, general manager of the Trenton Brass & Machine Co., Trenton, N. J., is home after an extended trip through the west.

Dr. O. S. Townshend, assistant to Dr. W. E. Wheatley, physician of the National Tube Co., Lorain, O., has resigned to begin private practice at Oberlin, O., Aug. 1.

Samuel Wilson, formerly associate engineering editor of THE IRON TRADE REVIEW and more recently connected with the Board of Trade, Dayton, O., has been elected secretary of the Chamber of Commerce, Johnstown, Pa. Mr. Wilson will enter upon his new duties Sept. 1.

J. R. Wettstein, president of the United Lead Co., 111 Broadway, New York, and Louis Weil, 42 Broadway, New York, have been elected members of the New York metal exchange.

Frank E. Leahy, a newly elected member of the American Iron and Steel Institute, was born in Philadelphia, Dec. 21, 1885, and graduated from the public schools of Jersey City in 1900, from Stevens Preparatory School in 1903, and from Stevens Institute of Technology in 1908, with the degree of mechanical engineer. He went with the Carnegie Steel Co.,

FRANK E. LEAHY
New member American Iron and Steel Institute

Clariton works, July, 1908, as testing engineer and was appointed steam engineer in April, 1910. In January, 1911, he was appointed a member of the United States Steel Corporation committee of steam engineers, representing the Carnegie Steel Co. Since August, 1910, he has been with the National Tube Co. as assistant steam and hydraulic engineer, located at McKeesport, Pa.

L. H. Shoemaker has been appointed division engineer at Pittsburgh of the American Bridge Co., to succeed Richard Khuen Jr., the latter having been transferred to the erecting department.

W. B. Ruggles, of the Ruggles-Coles Engineering Co., 50 Church street, New York, has left for Europe, where he will remain until about Aug. 15. Most of his trip will be spent in England.

Joseph Buffington, judge of the federal circuit court, has resigned membership of the board of trustees of the Carnegie Institute, Pittsburgh, because his almost constant residence at Philadelphia prevented him from attending the board meetings. His successor will not likely be named until the September meeting of the board.

Windsor T. White has been elected president of The White Sewing Machine Co., Cleveland, to fill the vacancy caused by the death of his father, Thomas H. White. Secretary W. W. Chase was elevated to the first vice presidency, but will continue to act as secretary. Walter C. White was made second vice president. President White's connection with the company began in 1891. He is also president of The White Co., manufacturer of automobiles, which position he has filled since 1906.

Thomas B. Harkins, president of the T. B. Harkins Foundry Co., of Bristol, Pa., recently celebrated his forty-third year in business by entertaining his employes. In his office is his motto: "Always pay 100 cents on the dollar". He started on the bottom rung and has worked up the ladder step by step. He went to Bristol in 1856 from Hulmeville, Pa., where he had received his first smattering knowledge of cast iron molding. He was but 12 years old when he watched the work in a big plant. He afterwards worked for the A. B. Smith Machine Co. at Smithville, N. J. Iron molding was always his hobby when a boy and later a young man. He quit his trade long enough to fight in the Civil War. Following the war, he built a foundry but 25 feet square. At that time only two heats a week were run. W. P. Pray and W. P. Thompson, of Phladelphia, were his partners at one time. The Bristol Improvement Society gave him a start and he has since erected five additions. Some of his men have worked for him for 35 years. He is a staunch Republican and has held office several times. Mr. Harkins has made a number of successful inventions, the chief one of which is a machine by which sash weights are molded.

More Promising

Situation is Reported by the U. S. Steel Corporation

New York, July 15. (By wire.)—New business and specifications with the United States Steel Corporation are showing further gain. Both orders and production for the first half of July are running ahead of June. Two additional furnaces have been ordered in, one Edgar Thomson and one Duquesne, of the Carnegie Steel Co., making three stacks added to the active list since June 30. Ingot operations remain around 65 per cent of capacity.

Consumers' specifications are expanding, indicating that their operations are gradually changing for the better. The situation from the Corporation standpoint is considered more satisfactory and promising.

Pipe Contract

Not Awarded to American in Spite of Low Price Quoted

New York, July 15. (By wire.)—In recent competition for a year's requirements of water pipe for London, R. D. Wood & Co., Philadelphia, underbid the English syndicate 25 cents a ton. Public sentiment and pressure brought to bear upon the city authorities not to allow American made pipe to be used in the English metropolis resulted in the contract finally being awarded to the syndicate at its higher price. The particular specifications bid upon called for 15,000 tons of assorted sizes, but the form of contract was made elastic to cover a year's full requirements which probably would have run 50,000 to 100,000 tons.

Will Require Large Tonnage

Pittsburgh, July 15. (By wire.)—Fabricators in this district are interested in the proposed city hall and county court house building to be erected jointly by the city of Pittsburgh and Allegheny county. Plans have not yet been prepared. It is estimated that the structure will require 10,000 tons.

Furnace Operations Declining

Merchant blast furnace operations in the east continue gradually to decline. The Leesport, Pa., stack, which has been running on high phosphorus, has gone out. The Port Henry, N. Y., furnace, which has been operated for the past six months by the McIntyre Iron Co., upon experiments with New York state titaniferous iron ores, will go out the end of the present month, as these tests have been completed. The Thomas Iron Co. is planning soon to blow out its one active Hokendauqua, Pa., furnace, and will blow in one or two of its smaller Alburtis stacks.

Basic Inquiry

From Kokomo is About to be Closed—Southern Prices Still Low

Cincinnati, July 15.—An inquiry of 15,000 tons of basic pig iron for Kokomo, Ind., is about to be closed.

General inquiry appears to be confined to small tonnages and sales are few.

Spot southern iron is obtainable on the $10, Birmingham basis, for No. 2. The general figure is $10.25 for last half. Shipments of iron are being suspended as buyers prefer to wait awhile and take advantage of the coming lower freight rates.

Bar Contracts

Being Actively Made by Implement Manufacturers

New York, July 15. (By wire.)—Further active contracting of bars by implement trade has been done the past week, especially in the Chicago district, where about 50,000 tons were placed. The International Harvester Co. tonnage still hangs fire.

Automobile builders have been liberal buyers of sheets and bars.

Will Not Move Plant

New York, July 14.—The Patterson Allen Engineering Co., with offices at 2 Rector street, has abandoned the plan of moving its plant from Jersey City to Lancaster, Pa. The Jersey City plant now consists of a machine shop, brass foundry and pipe flanging department, located near Westside avenue. A forging department, 50 x 200 feet, is being added to the plant and this will be completed within 90 days. The forging plant is to be used for making forged steel fittings and valves, in the manufacture of which the company plans to specialize. The building will be equipped with special machinery and the forged steel fitting and valve department will be in charge of Wm. Neil Howell, formerly of the Lake Torpedo Boat Co., Bridgeport, Conn., who just has become associated with the Patterson Allen company. The Patterson Allen company will continue to manufacture pipe flanging machinery and blow-off valves as heretofore.

Rail Buying

Shows Some Improvement—Steel Railways in Market

New York, July 15. (By wire.)—There is increasing buying activity in railroad circles, particularly in the middle west. Rail sales of the week exceed 40,000 tons, including 16,000 awarded the Tennessee company for the Southern railway, which has some additional tonnage to place, 17,000 for Rock Island, of which 10,000 went to the Colorado Fuel & Iron Co., and 7,000 to the Illinois Steel Co.; 2,000 for the Chicago & Western Indiana to the Illinois Steel Co.; 1,000 for the Inter-mountain railway to the Illinois Steel Co., and 1,500 for the Pittsburgh & Shawmut to the Carnegie Steel Co.

The Denver & Rio Grande is inquiring for 15,000 and about 7,000 are out for export.

There is better buying of street railway material and sales of this week include about 5,000 girder rails by the Lorain Steel Co.

Indiana Rails are Offered

New York, July 15. (By wire.)—Representatives of the Tata Iron & Steel Co., of India, have been offering rails to northwestern roads, including the St. Paul, the Northern Pacific and others, but so far no sales closed. This maker, it is announced, has 20,000 tons to market in this country for the year beginning July 1.

Tin Plate Mills Busy

Pittsburgh, July 14.—Although there is no buying of consequence, tin plate mills in this district continue to operate at practically maximum capacities, and there is no indication that schedules will be reduced until autumn. Mills are asking $3.30 for base sizes, although attractive tonnages are obtainable at $3.25.

McKinley Portrait Unveiled

An Associated Press cablegram, dated London, July 14, is as follows:

"A portrait of the late President William McKinley, presented to the Wesleyan Methodist Central Hall in Westminster by J. G. Butler Jr., of Youngstown, O., was unveiled today by Walter Hines Page, American ambassador. Sir Robert William Perks, a son of the Rev. G. T. Perks, former president of the Wesleyan conference, presided, and in his speech referred to the 'wonderful influence for good exercised by Methodists in the United States'."

New Warehouse in Twin Cities

Facilities Provided by the Illinois Steel Warehouse Company to Serve Consumers of Iron and Steel in the Northwest

FOR SOME YEARS the United States Steel Corporation has steadily pursued the policy of enlarging its warehouse facilities so as to more easily reach consumers in all parts of the country. The latest addition to the chain of plants which now extends from the Atlantic to the Pacific coast is found in the northwest, where a new warehouse has been constructed at St. Paul, Minn. It was built and is being operated by the Illinois Steel Warehouse Co., a subsidiary of the United States Steel Corporation, and is conducted in close touch with the North Works warehouse of the Illinois Steel Co. at Chicago. The St. Paul plant was built under the general direction of William Pratt, president of the Illinois Steel Warehouse Co. with the assistance of L. C. Douglass, superintendent at St. Paul.

The new plant is essentially a plain material warehouse, only a few specialties being carried in stock at present. No sheets lighter than 18 gage are carried. Although the warehouse has sufficient capacity to handle a stock of about 25,000 tons, it is believed that 15,000 tons will be sufficient for the needs of the community for some time to come and the stock is proportioned on this basis. It includes a full line of shapes, plates, bars, etc., particular attention being paid to concrete reinforcing material. The stock of sheets heavier than 18-gage is large; a considerable quantity of shafting and a plentiful supply of rivets are also kept on hand. As the needs of the territory are developed, other specialties will be added to the stock. The tendency for warehouses to increase the variety of their stock is growing and the demand for special analysis steel from automobile and agricultural implement manufacturers and others is constantly increasing.

The extent and variety of the stock now carried at the St. Paul warehouse indicates the growing importance of the central northwest to the iron and steel industry. States which only a few years ago were almost entirely agricultural in character are now dotted with factories which consume thousands of tons of iron and steel products annually. The consumption in the district immediately surrounding Minneapolis and St. Paul has been phenomenal and today the Twin Cities form one of the most important buying centers in the country.

FIG. 1—INTERIOR OF NEW ST. PAUL WAREHOUSE OF ILLINOIS STEEL CO.

The Territory Served

The St. Paul warehouse serves the states of Minnesota, North and South Dakota, and a small portion of northern Wisconsin. At present nearly three-quarters of the business originates in Minneapolis and St. Paul and special study has been given to the local delivery problem in order that consumers in the Twin Cities may be served with practically no delay.

The various products which makes up the stock of the St. Paul warehouse are obtained almost entirely from Chicago mills at the present time, the South Chicago, Gary and Joliet plants of the Illinois Steel Co. furnishing the bulk of the tonnage. Some bars, of course, are obtained from the Milwaukee mills. As soon, however, as the new plant of the Minnesota Steel Co. at Duluth is in operation it will be called upon to supply a large portion of the needs of the St. Paul warehouse. With the Duluth plant in operation, the St. Paul store will be much closer to the source of supply than it is at present and a considerable saving in freight also will be possible. The freight rate on steel products such as beams and plates in carloads from Duluth to St. Paul is 7½ cents per hundred pounds, as compared with 14 cents from Chicago to St. Paul; the less than carload rate is 17 cents from Duluth to St. Paul and 25 cents from Chicago to St. Paul. From these figures it will be seen that the Duluth plant has a freight differential of $1.30 per ton in its favor in shipping to the Twin City territory.

At the present time the Illinois Steel Warehouse Co. is quoting iron and steel bars and small shapes at $1.75 per hundred pounds f. o. b. St.

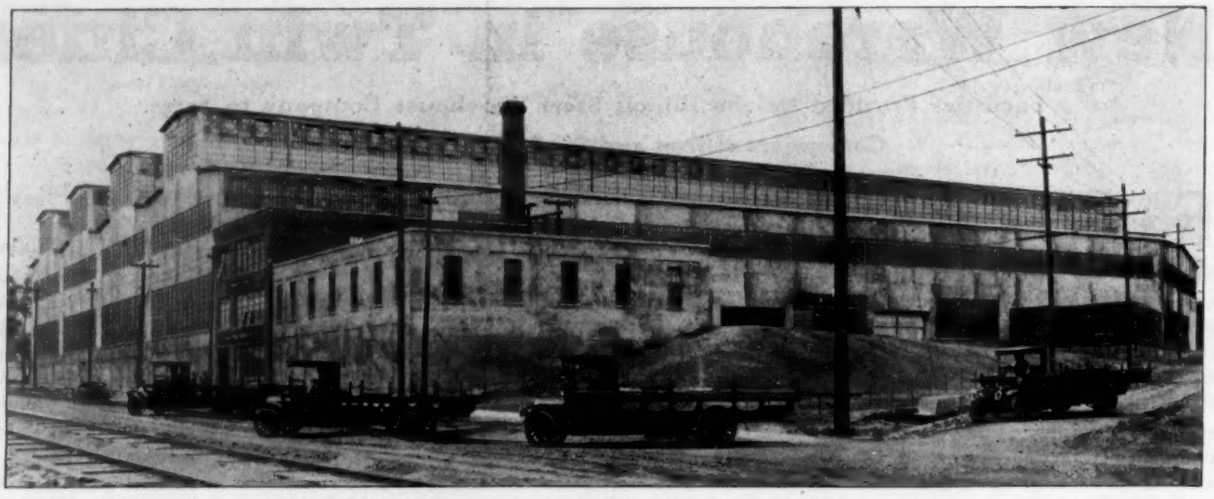

FIG. 2—EXTERIOR OF NEW ST. PAUL WAREHOUSE

Paul, with the usual extras for cutting to length, etc. The price on shapes and plates is $1.85 per hundred pounds and the same figure applies to No. 10 blue annealed sheets. Generally speaking the quotations are four cents per hundred pounds less than the Chicago price plus the full carload freight rate. This concession is made owing to local conditions and on account of the importance of the Twin City district from a tonnage standpoint.

The St. Paul warehouse is located in the Midway district just east of the line which divides Minneapolis and St. Paul. It is therefore so situated that shipments may be made with equal facility to either city. This location is also advantageous on account of its proximity to large freight stations and to the Minnesota transfer yards, where an abundance of cars is always available. A large number of the prominent manufacturing plants in the Twin Cities are also located in the Midway district, near the new warehouse of the Illinois Steel Co. Sufficient property has been acquired so that the present plant may be doubled in size as soon as the volume of business warrants. Ample facilities are provided for making carload shipments. Two standard gage spur tracks traverse the full width of the warehouse and connect with the main line of the Northern Pacific railway nearby.

Cement Coated Walls

The building is of concrete and steel construction, the frame being fabricated of structural steel, while the walls are formed of wire mesh covered with a 2-inch coating of cement. The cement was laid on the walls by means of a cement gun. The west wall, which is temporary, is covered with corrugated steel siding. The building is 272 feet wide and 475 feet long, being divided into four 68-foot spans. It fronts on University avenue as shown in the accompany illustrations. The office building and garage are located alongside the warehouse on University avenue. A large proportion of the walls and monitors over the four crane runways are glass and the warehouse is exceptionally well lighted. Artificial illumination is provided by large clusters of Mazda lamps spaced at frequent intervals. No special arrangements have been made to heat the warehouse in winter. A concrete floor is laid at the south end of the building where most of the tools are installed. The beams, channels and other heavy material are carried on a tamped cinder floor and a heavy plank floor is laid in the sheet storage department.

Each of the four bays is spanned by a 10-ton double girder electric traveling crane furnished by Pawling & Harnischfeger Co., Milwaukee. Each crane has a maximum lift of 24 feet and a traveling speed of 450 feet per minute. The cranes are provided with two independently operated trolleys for handling long bars and beams. The material is handled in chain slings in the usual manner. The stock is so distributed on the floor that all unnecessary crane travel is avoided. For this reason the heavy beams are stored at the north end of the center bay and lighter materials are placed between them and the cutting floor.

A complete set of tools for cutting bars, plates and shapes to lengths to suit customers' requirements is provided. The tools all are driven by individual electric motors. Alternating current is purchased from the Consumers Power Co., of Minneapolis, which operates several hydro-electric plants on the Mississippi and St. Croix rivers. A motor-generator set installed at the warehouse changes the electrical energy from alternating to direct current. One of the principal tools in the new warehouse is the 52-

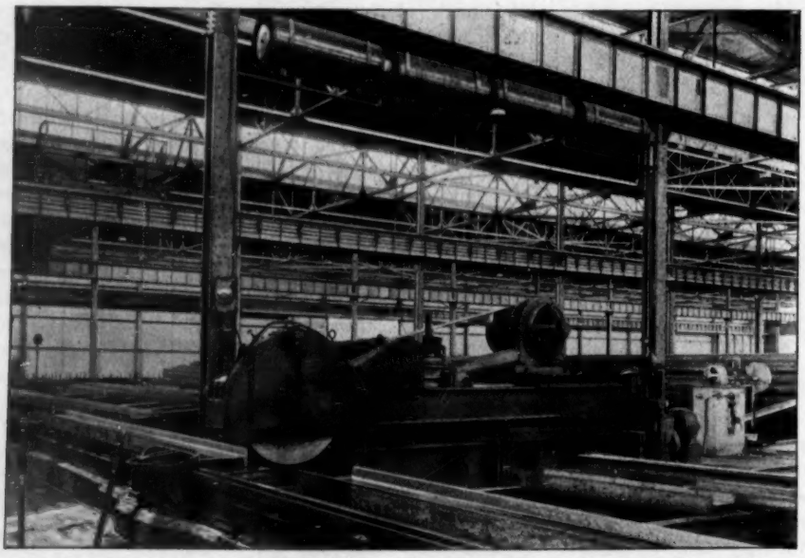

FIG. 3—FIFTY-TWO-INCH FRICTION SAW IN ST. PAUL WAREHOUSE

inch high-speed friction saw, shown in Fig. 3. It was designed and built by the Illinois Steel Co. and can cut the largest beam or channel in a few seconds. This saw is provided with a specially designed electric driven sharpener, which is shown at the extreme right in Fig. 3. An electric driven air compressor is located between the friction saw and the sharpener. A slow-speed saw for cutting shafting has also been provided. Shears for cutting plates, sheets, bars and angles were furnished by the Long & Allstatter Co., Hamilton, O. The plate shears will handle any plate up to 72 inches wide and 1 inch thick; the sheet shears are also 72 inches wide and are designed to shear sheets or plates up to ¼-inch thick. The bar shears will cut 2-inch cold rounds or squares and flats up to 30 inches wide and 1 inch thick. The double angle shears will cut two 8 x 8-inch angles at one stroke. A number of portable Fairbanks scales are provided for weighing shipments, and the bar scale is equipped with a cradle or rack for handling bundles of bars conveniently.

As mentioned above a large portion of the business received at present comes from plants located in the immediate Twin City territory. In order to handle this tonnage expeditiously four 5-ton Saurer gasoline motor trucks have been purchased and a garage with a capacity of 12 trucks has been built. The shipping department is so arranged that trucks drive right into the warehouse under the crane runways, where they are loaded by the traveling cranes without loss of time. The garage has a concrete floor so arranged that the trucks may be washed and filled with gasoline and lubricating oil at any point where they happen to stand. This has considerable advantage over the usual method of providing a single wash rack where only one or two trucks can be washed at one time.

A roomy locker and wash room has been constructed adjacent to the warehouse for the convenience of the employes. Each man is provided with an individual locker and the toilet facilities include a shower bath, individual wash bowls and the usual other conveniences. The locker and wash rooms are steam heated.

The office building is 40 feet wide and 50 feet long, three stories high, of brick construction with concrete floors covered with battleship linoleum. The warehouse offices are on the ground floor, the executive offices on the second floor, and the accounting department is located on the third floor. The office is situated between the warehouse and garage, where future extensions to the plant will not interfere with it.

Methods of Determining Hardness

BY EDWARD J KELLEY

THERE are as many different kinds of hardness as there are different kinds of stress by which hardness can be determined. Thus, by compression hardness, we mean the resistance a substance offers to indentation by another body. Abrasion hardness is the resistance offered by a smooth surface to scratching. The resistance which a metal offers to drilling or working in any machine tool is designated as the cutting hardness. Other forms of hardness include elastic hardness, mineralogical hardness, file hardness, hardness against wear, etc.

The file method was the earliest form of test and Moh proposed a scale of hardness for that purpose by selecting 10 substances so that each would be scratched by the next above, etc. This test will serve for brittle bodies, but not for ductile ones. Turner's scratch method consisted in using a sclerometer having a balanced lever which rested on a knife-edge and was provided with a sliding weight. The lever was graduated so that each division on the scale equaled one gram at the scratching point. The lever also rested on a pivot so that the diamond point could be moved over a fixed specimen. The surface to be scratched was polished with emery, and oiled.

Martel's method is an indentation test in which the indenting tool is a pyramidal point. Indentation is produced by a falling weight. The volume of indentation is calculated from one measurement of the length of the indentation. The volume of indentation for any one metal is proportional to the work of the falling weight. Martel's method is simple; the only objection is that it is not always convenient to use a heavy falling weight to produce the indentation. In Unwin's method the indentation is produced by a steady load, and a straight knife-edge is used.

The Brinell Method

Brinell's method is based upon determining the resistance offered to indentation by a hardened sphere when the sphere is placed on the metal under investigation and subjected to a given pressure. The method of carrying out a hardness test is to indent the metal under test with a sphere 1 centimeter in diameter subjected to a pressure of 500 kilograms for the softer, and 3,000 kilograms for the harder metals. Brinell defined the hardness as the pressure in kilograms per square millimeter of spherical indentation. Since then it has been shown by Le-Chatelier, Leon and Meyers, that the hardness numeral is dependent upon the size of the sphere and the pressure.

In making a determination by this method, a micrometer microscope reading to 1/1,000 millimeter is focused upon a line drawn upon the piston and a reading taken. The desired pressure is then applied and released to the point of initial pressure before the final reading is taken. The difference between the initial and final reading is equal to the depth of indentation of the sphere. The diameter of indentation is measured and from it, the depth of indentation is calculated from the following formula:

$$T = \frac{D}{2} - \frac{\sqrt{D^2 - d^2}}{4}.$$

where T = depth of indentation
D = diameter of sphere,
d = diameter of indentation.
The Hardness Number is then

$$H.N. = \frac{P.}{\pi tD.}$$

Where P = entire pressure on the sphere and πtD = area of spherical indentation.

The Ludwik cone test is the same in principle as the sphere hardness test, except that a cone having an angular opening of 90 degrees is substituted for the sphere. The depth of indentation is measured, from which the area of the conical indentation is calculated. The hardness number is then found by dividing the pressure by the area of the conical indentation. The principal claim for the cone form of hardness test in preference to the sphere, is that the cone makes indentations which are geometrically similar for different pressures. The instrument generally used in making this test consists of a cylin-

Lecture given before the chemical staff of the Standard Testing Laboratory, New York, March 14, 1914.

drical steel center-punch, plane above and ground to a right-angled cone below, which is vertically mounted in a casing of bronze, in which it is free to turn.

The displacement of the cone is transferred to a pointer by means of an elastic threaded bushing and a toothed wheel. The cone can easily be exchanged and be re-ground. The one limitation of this form of test, however, is that the cones flatten under pressure.

COMPARISON OF SCLEROSCOPE AND SPHERE TESTS

	Scleroscope method.	Sphere method.
Tool steel	86.1	641.0
Silicon steel	33.6	262.0
Manganese steel	29.5	179.0
Cast iron No. 1	33.3	149.0
Cast iron No. 2	32.9	172.0
Bessemer steel	26.6	185.0
High carbon steel	37.8	289.0
Cu (70) Su (30), Alloy No. 1	42.4	110.0
Cu (80) Su (20), Alloy No. 2	25.5	101.5
Cu (90) Su (10), Alloy No. 3	22.1	94.7
Copper No. 4	15.0	88.5

The scleroscope is an instrument consisting of a pointed hammer which falls from a definite height through a guiding glass tube upon the metal to be tested. The height to which the hammer rebounds is the measure of the hardness and is read directly from a scale placed back of the glass tube. This scale is approximately 10 inches in height and is arbitrarily divided into 140 equal parts. The hardness numeral is therefore an arbitrary unit. The blow delivered by the drop hammer has an impact pressure of at least 250 tons per square inch; hence it crushes the hardest steel. The scleroscope test is a measure of surface hardness whereas the Brinell test is dependent upon the condition of the material below the surface. By combining these two tests, a method has been devised for testing case-hardened steel for depth of carbonization and efficiency of heat treatment.

In the scleroscope test, the height of rebound which is caused by the elasticity of the metal is modified by the form and size of the indentation. If this is comparatively large, as for a soft metal, the rebound is retarded. If it is small, as for a hard metal, the hammer rebounds with greater freedom. Hence, the indications of the scleroscope are a function of the elasticity within the elastic limit and of the size of the deformation produced beyond the elastic limit, and therefore the results obtained by the scleroscope are comparable only for the same class of metals. Also, rubber, glass, paper and similar substances should not be compared with metals, because for these substances, elasticity alone affects the height of rebound. The Shore hardness is a function of resistance to indentation as well as of the elastic limit.

The Bauer drill test or Keep's drill test indicates the cutting hardness and determines the workability of metal, but this test cannot strictly be considered a hardness test, because the workability of metals depends upon their toughness and abrasive qualities as well as hardness. The machine has for its essential parts: A fluted drill driven at constant speed; a table upon which the metal to be tested is placed and from which weights may be suspended for securing desired pressures; and an autographic attachment which traces a curve whose ordinates are some constant multiple of the depth of the hole drilled and whose abscissas represent some constant multiple of the number of revolutions required to drill a given depth. The metal to be tested is securely clamped on the table, and the weights needed to give the desired pressure are hung on the supports attached to the table. The point of the drill is allowed to drill into the metal before the diagram tracing attachment is thrown into gear.

If the drill dulls, it becomes apparent at once from the change of slope of the curve. The drill must then be taken out and sharpened. Of all the metals tested by the other methods, only a few could be tested by the Bauer method. The line traced by the autographic apparatus shows a linear relation between multiples of the depth of hole drilled and the revolutions required to drill it. The tangent which this line makes with the Y-axis is taken as the hardness numeral. For metal as hard as the steel drill, the line traced is the X-axis. The hardness numeral of such metal is therefore infinity.

IMPACTS NECESSARY IN ORDER TO OBTAIN CERTAIN DEPRESSIONS

	Depth of depression. 4 m. m.	1 m. m.
Copper	19	7
Bronze of 97 parts copper	23	8 to 9
Bronze of 96 parts copper	27	10
Bronze of 95 parts copper	38	14
Bronze of 94 parts copper	40	15
Bronze of 90 parts copper	Did not succeed with 70 blows	

Discussion of Methods

The cone and sphere tests give results that are quite concordant. The Brinell and Shore hardness tests are alike in that they respectively measure hardness in the region of permanent deformations. In the Brinell test, the indentation is made under static pressure and the hardness is the resistance offered. In the Shore test, the indentation is made by an impulsive force, but it is not altogether clear what the height of rebound indicates. The cold-working imparted to the metal increases both its elasticity and hardness. This can be seen by allowing the hammer to rebound twice from the same indentation; the second rebound is higher for all metals. Results also show that there is no constant ratio between hardness by the scleroscope and the elastic limit of the material.

Professor Turner has compared the four methods, Turner's scratch, or sclerometer method, Shore's scleroscope test, Brinell's test, and Keep's test. He says each has its advantages and limitations. The sclerometer is cheap, portable, and easily applied, but is not applicable to materials not possessing a smooth reflecting surface. The Shore test is simple and rapid, but we don't know the exact property that it measures; India rubber gives a rebound of 23; so does mild steel. Light soft pine wood gives a rebound of 40, which is double that of gray cast iron. And again, hard wood like teak, gives a rebound of 12.

Furthermore, the support has great influence; hard rolled copper when supported on a block of hard steel, gave a value of 30, which is increased to 34 when supported on wood. A sample of brass only gave a value of 17, and yet this brass scratched the copper, while the copper wouldn't scratch the brass. Hence, the Shore test is only applicable to a certain class of substances; it appears to test the "elastic hardness." The

(*Continued on page 142b.*)

Power Questions in Steel Mills

A Comparison of the Various Methods of Generating Power for use in Driving Heavy Roll Motors

BY A DYCKERHOFF E E

(Concluded from THE IRON TRADE REVIEW of July 2.)

WE HAVE SEEN that the energy demanded on a roll train is of the most intermittent character and that an energy storage in the form of a flywheel must be provided. In most cases a flywheel with the motor is indispensable for driving roll trains, which type of motive power responds to any required momentary torque up to the maximum. In this respect it cannot be equaled by the steam engine. On account of the fact that the flywheel must be selected from consideration of certain peak loads, and because of the limitations of the slip device, the reduction of the energy demands on the motor is limited. In any case it is impossible to maintain absolutely uniform demands on the line. These impulses of energy-demand, which are constantly present in a steel mill power system with any number of roll train motors, must be carried by the generators and their prime movers. In addition, impulses of energy-demand of a much smaller degree are imposed by motors driving auxiliaries such as live rolls, cranes, etc. Furthermore, the grouping of energy demands relating to various motors and mills can never be kept to any predetermined schedule, and consequently the demands may occur successively or simultaneously, with more or less diversity. In the case of a mill operating in one direction and driven by a motor with a flywheel, the energy demand in excess of the average demand can easily reach 50 per cent of the mean value under ordinary rolling conditions. With reference to an electrically-driven reversing mill with an interposed Ilgner set, the excess energy demand (peak) on the three-phase motor line may readily reach 35 per cent of the mean value. Frequently the load on the several mill drives can vary from friction load up to loads far above the nominal rating of the roll motor. When such loads occur without diversity they impose the heaviest demands on the power plant.

A satisfactory service of a steel mill power plant comprises continuity of uniform energy supply, fairly constant frequency, and thereby good voltage regulation. A low frequency and bad voltage regulation can involve commercial losses in a great many cases, mainly due to delays in the mills. The requirements of service must be met, and a preliminary study of the load is imperative after which the power plant and equipment must be adapted to the load. In order that the generating units can meet the impulsive energy demands on the line and maintain good frequency, such prime movers are most desirable which possess the highest over-load capacity with the best economy. This is a fundamental requirement of steel mill power plants subject to heavy rolling mill demands. Let us now see what are the characteristics of the various types of generating units which have to meet the variable energy demands.

In most steel mills with a considerable number of roll motors, the three-phase system prevails in America as well as in Europe. This was shown in the first article by the statistics of alternating and direct current motors. Correspondingly, alternating current generating units dominate the field. As to the type of prime movers, there is in general very little room left for the steam engine and blast furnace

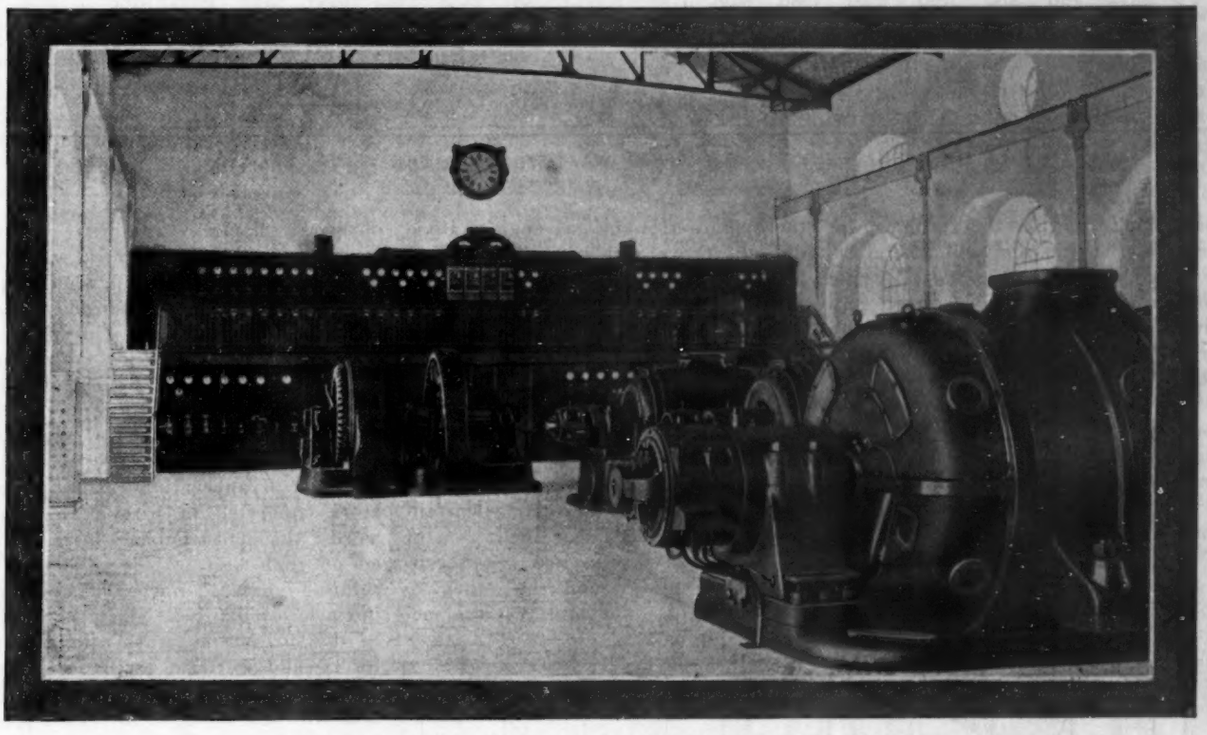

FIG. 11—STEAM POWER PLANT OF A RUSSIAN IRON WORKS

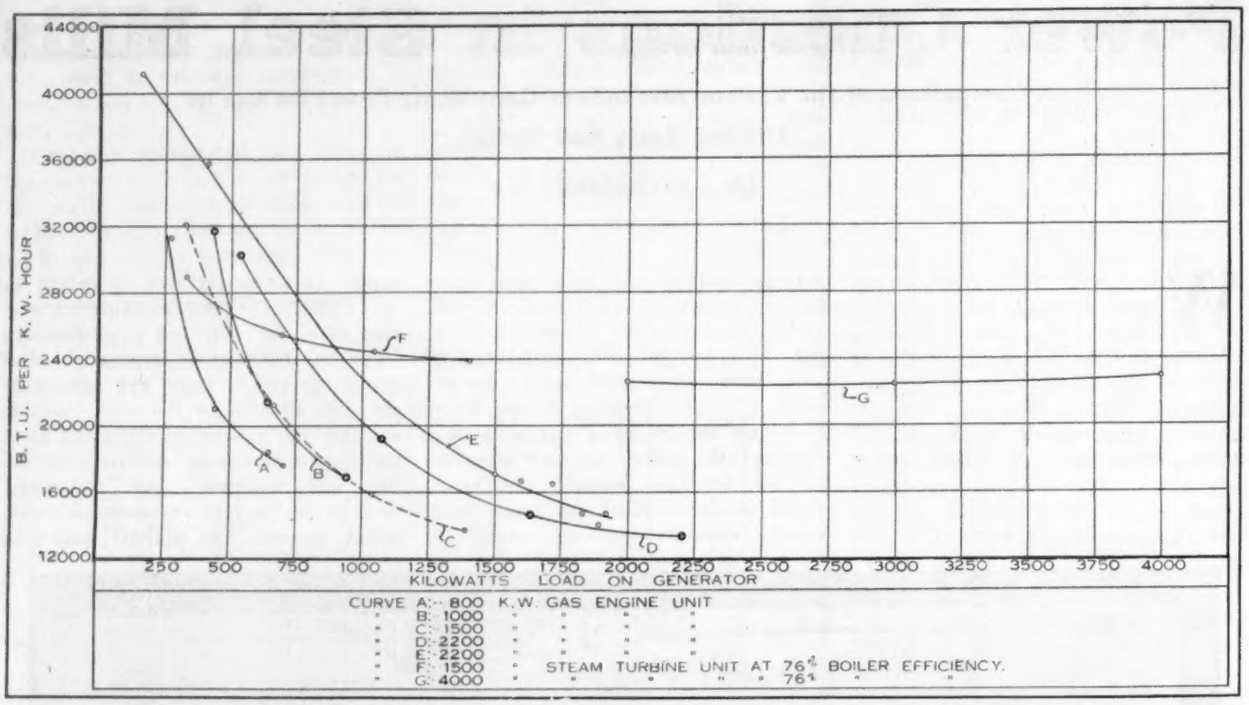

FIG. 12—RELATION OF HEAT UNITS REQUIRED PER KILOWATT HOUR TO THE VARIOUS LOADS ON ALTERNATING CURRENT GENERATOR

gas engines and steam turbines are the rivals. Attention will, therefore, be confined to these types of prime movers. The growth of steel mill power plants will be appreciated by the fact that at least four power plants are in operation with a yearly output of 100 to 320 million kilowatt hours. Some plants are equipped with gas engines only, some with steam turbines, and some with a mixed system of gas engines and steam turbines. This latter system has been adopted to a very great extent in Germany in recent years wherever a certain roll motor load exists, apparently because the operation of the gas engines alone did not prove satisfactory at such a load. This is not remarkable in view of the unstable conditions of the alternating current gas engine units and of their low overload capacity. A few remarks concerning the different inherent characteristics of the alternating current gas engine and the alternating current steam turbine unit will be in order.

The gas engine alternating current generating unit is under the action of two principal forces, one relating to the prime mover and the other to the generator. The unit receives mechanical impulses from its various reciprocating pistons and is, with the natural function of the flywheel, subject to more or less periodic speed changes, the alternating current generator being subject to the same speed changes. The alternating current unit must consequently perform forced oscillations of a certain frequency. The other force is mainly related to the interaction of alternating current generators connected in parallel, in other words, the synchronizing force exerted on each unit by the others. The rotating masses must thus perform intrinsic oscillations which may also be due to various other causes. The forced and intrinsic oscillations combine to compound oscillations of the unit with the result of increased speed variations. The polewheels, as parts of the rotating masses, are forced to perform the same oscillations and to change their positions relative to the stator fields. Since any position corresponds to a certain energy delivery to the line it follows that large energy fluctuations are forced upon the generator by its prime mover. Consequently, the alternating current generator under the action of those forces cannot respond to such a quick energy delivery, with variations occurring on roll trains, as an alternating current generator driven by a steam turbine. A steam turbine driven alternating current unit is free from forced impulses and does not exhibit material intrinsic oscillations. It, therefore, can adapt itself inherently

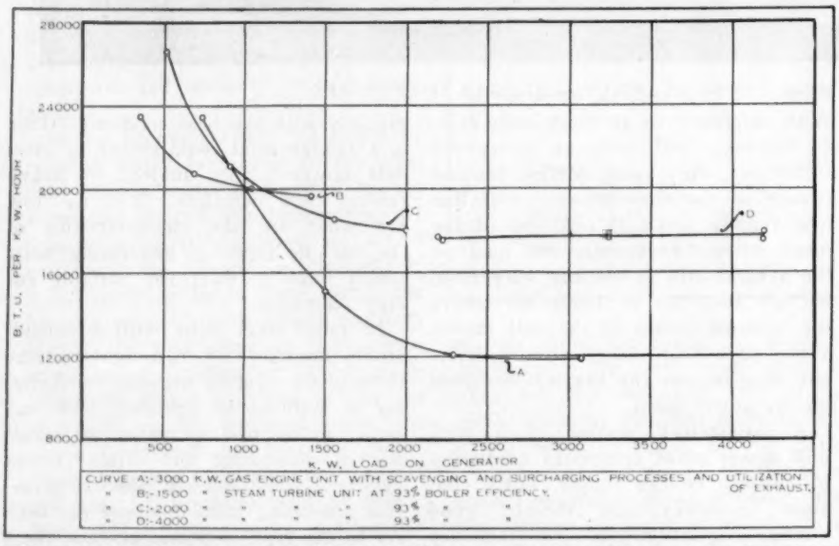
B. T. U. PER K. W. HOUR
28000
24000
20000
16000
12000
8000
500 1000 1500 2000 2500 3000 3500 4000
K. W. LOAD ON GENERATOR
CURVE A:-3000 K.W. GAS ENGINE UNIT WITH SCAVENGING AND SURCHARGING PROCESSES AND UTILIZATION OF EXHAUST.
" B:-1500 " STEAM TURBINE UNIT AT 93% BOILER EFFICIENCY.
" C:-2000 " " " " 93% " "
" D:-4000 " " " " 93% " "

FIG. 13—RELATION OF HEAT UNITS REQUIRED PER KILOWATT HOUR TO THE VARIOUS LOADS ON ALTERNATING CURRENT GENERATOR

Table III.

HEAT BALANCE WITH GAS ENGINES AND STEAM TURBINES

4 gas engines in parallel with	189,600 k. w. hours each requiring 13,700 B. T. U.	Total	2.6×10^9 B. T. U.
3 steam turbines	74,400 k. w. hours each requiring 25,100 B. T. U.	Total	1.865×10^9 B. T. U.
Total k. w. hours, over 24 hours—264,000 k. w. hours require			4.465×10^9 B. T. U.
Average heat units required per k. w. hour		$\frac{4.465 \times 10^9}{264{,}000}$ =	16,900 B. T. U.
Average heat units required per k. w. hour, with 9 gas engines in operation			18,200 B. T. U.
Saving in B. T. U. per k. w. hour	18,200 B. T. U. — 16,900 B. T. U. =		1,300 B. T. U.
Saving in B. T. U. per working day	1,300 × 264,000 =		3.435×10^8 B. T. U.

more rapidly to momentary changes of load. Consideration must also be given to the governing mechanism which, as applied to blast furnace gas engines, is a region of seemingly insurmountable difficulties if the close regulative characteristic of steam turbines is undertaken.

Another disadvantage of alternating current gas engine units are the known troubles of parallel operation which can only be experienced with alternating current generators driven by prime movers of the reciprocating type, especially with gas engines. With steam turbine units similar troubles are entirely eliminated due to the absence of forced oscillations. While this is not the place to illustrate the various causes of interaction of the alternating current generating units, it is only necessary to mention those points which are for or against the various types. Under troubles of parallel operation are included excessive speed variations of alternating current units, their pumping and hunting, occurrences which make parallel operation sometimes impossible. A good standard requires a certain speed variation (irregularity factor) which, together with other features, not to be discussed here, is mainly dependent upon the moment of inertia of rotating parts. The inertia effect, together with the action of the generator, determines the frequency of the intrinsic oscillation which must be within certain limits in order to avoid resonance with forced frequencies of certain orders. The choice of the flywheel is sometimes limited. It may happen that a fair inherent speed regulation cannot be obtained on account of a small wheel as prescribed by the above requirements or, as an alternative, a very large wheel must be applied with attendant good speed regulation but entailing high first cost and decreased mechanical efficiency of the unit.

There is no doubt that the gas engine alternating current generating unit, under the action of the various oscillations, shows unstable conditions, and that it is not, as a type of prime mover, so readily adapted to heavy load impulses as the steam turbine, irrespective of the limited over-load capacity of the gas engine.

Use-factor and Load-factor

Frequently the term "use-factor" the mean load in kilowatts divided by the installed generator capacity, is misused in connection with steel mill power plants, e. g., if it is asserted that the use-factor of a certain power plant is "very high" without mentioning the rating of the units and the load conditions. Under such conditions the mere statement of a high use-factor does not convey any meaning since it may be high while the service (frequency and voltage regulation) is poor. Furthermore, the term "installed generator capacity" (rating) is arbitrary and incomplete. Applying the so-called "maximum rating", which is used frequently in public service corporations, and which may, in many cases, also be adopted for generating units of low overload type as, for example, gas engines, the use-factor may be 0.40 for the sake of illustration. Such a use-factor will increase with the installation of more generating units of the over-load type and, if all of the new units have an over-load rating of 50 per cent the use-factor will be 0.60 for the whole power plant under the same load conditions.

Since the term use-factor does not identify the load conditions, impulses or maximum energy demand on the line, it is necessary to consider also the load-factor, the mean load divided by the maximum demand on line, together with the use-factor in order to specify the conditions. These factors, together with curves showing the relations of electrical load on the generating unit and the heat units required to generate one kilowatt hour, will reveal with what type of power plant or prime mover the most satisfactory and economical service is obtained. In the above "factors" no specific reference has been made to a particular length of time, this being a local problem.

These general statements concerning the power plant and system, as a whole, compel detail consideration of

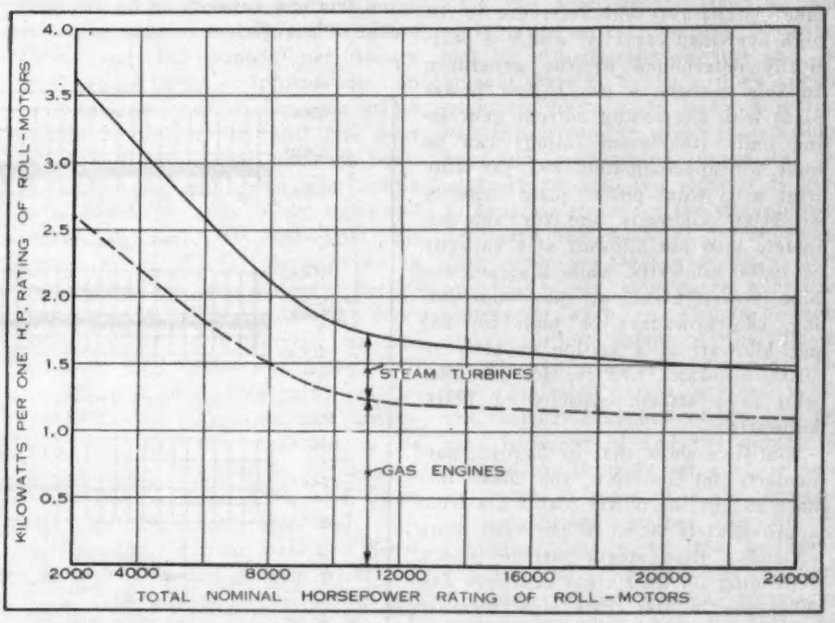

FIG. 14—RELATION OF SPECIFIC GENERATOR CAPACITY TO TOTAL NOMINAL RATING OF ROLL MOTORS

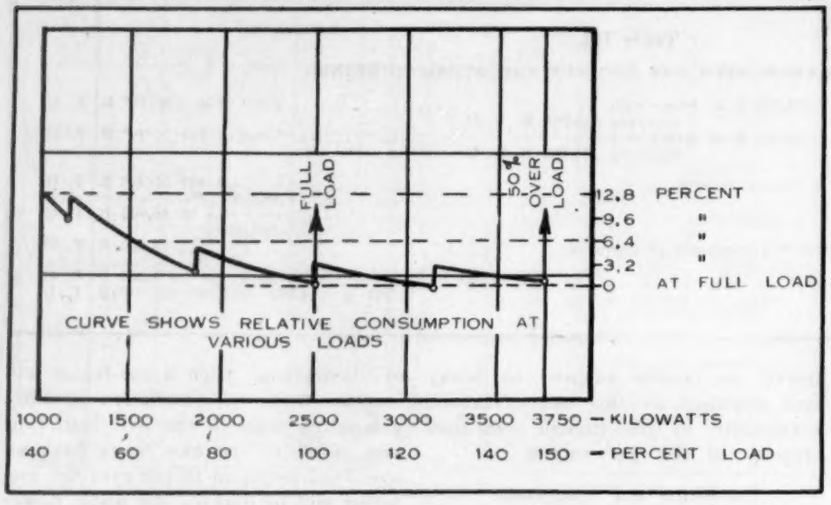
FULL LOAD
50% OVER LOAD
12.8 PERCENT
9.6 "
6.4 "
3.2 "
0 AT FULL LOAD
CURVE SHOWS RELATIVE CONSUMPTION AT VARIOUS LOADS
1000 1500 2000 2500 3000 3500 3750 — KILOWATTS
40 60 80 100 120 140 150 — PERCENT LOAD

FIG. 15—RELATIVE STEAM CONSUMPTION AT VARIOUS LOADS OF 2,500 KILOWATT TURBINE

the relative advantage of gas engines and turbines with reference to over-load capacity and to fuel demands. Before discussing this subject, brief attention is drawn to first costs of the power plant.

First Costs

Usually the comparison of first cost of power plants is based on the amount of money spent per kilowatt generator capacity. Thereby, in a great many cases, no mention is made of the power factor pertaining to the rating given nor to possible over-load ratings of the generating units. It is for these reasons, probably, that the first costs per kilowatt vary so greatly. When comparing such costs particular attention should be paid to the reduced first costs of steam turbine installations with reference to the high over-load capacity, which is practically determined by the generator. In this country a gas engine power plant with alternating current generating units (maximum rating) can be built for approximately $92 per kilowatt at a total power plant capacity of 50,000 kilowatts and for approximately $106 per kilowatt at a capacity of 10,000 kilowatts, while a steam turbine power plant, at maximum rating, can nowadays be built for $55 per kilowatt at a station capacity of 50,000 kilowatts, and for $68 per kilowatt at a station capacity of 10,000 kilowatts.

Statistics show that in Europe, particularly in Germany, the blast furnace gas engine power plants are from approximately 40 to 60 per cent more expensive than steam turbine plants, depending on their total capacity. The difference in first costs must increase in favor of the steam turbine plant with the higher total capacity of the power plant, since the output of the gas engine generating unit is limited to a few thousand kilowatts, while the steam turbine unit can be built in sizes to suit any steel mill power plant. There is no reason why at least the same percentage of 40 to 60 per cent could not hold in the United States, and in fact it will be more in favor of the steam turbine unit, which has reached a higher stage of development here than the gas engine unit.

As pointed out above, the first costs of steam turbine plants will show still more favorably if the over-load capacity of the steam turbine is utilized and compared with gas engine units from which only little over-load capacity can be realized. The best method of obtaining high economy and overload capacity is by the provision of a sufficient number of nozzles. A good idea of this may be gained from Fig. 15, derived from *Electrical Review*, Sept. 3, 1909, which gives the relative steam consumption at various loads of a 2,500-kilowatt turbine. In cognizance of this important fact for steel mill power plants, steam turbine generating units have been modified in Germany for such applications. It is evident that a steam turbine plant with 50 per cent overload capacity as compared with a gas engine plant of no overload capacity can have a total rating approximately 50 per cent smaller (depending on character of load) than that of the gas engine plant under the same load conditions. The investment can be reduced correspondingly. In a particular case in a new steel mill plant and power house three turbo-generator units each of 4,000 kilowatts output were installed to the entire exclusion of gas engine alternating current units. Each turbo-generator set has an over-load capacity of 6,000 kilowatts, in other words, 50 per cent above nominal rating. This plant, according to an article in *Stahl und Eisen*, page 1,392, 1913, costs 90 marks per horsepower, or approximately $31 per kilowatt of nominal rating and approximately $20.50 per kilowatt on the over-load basis. Estimating expenses as 50 per cent higher in the United States the corresponding costs would be $46.50 per kilowatt and $31 per kilowatt on the over-load basis. The more variable the load is the better the prospects are of installing steam turbine generating units of the over-load type, either in parallel with gas engine units or forming a straight steam turbine power plant. In connection with this financial side of the power plant, attention is drawn to the fact, which

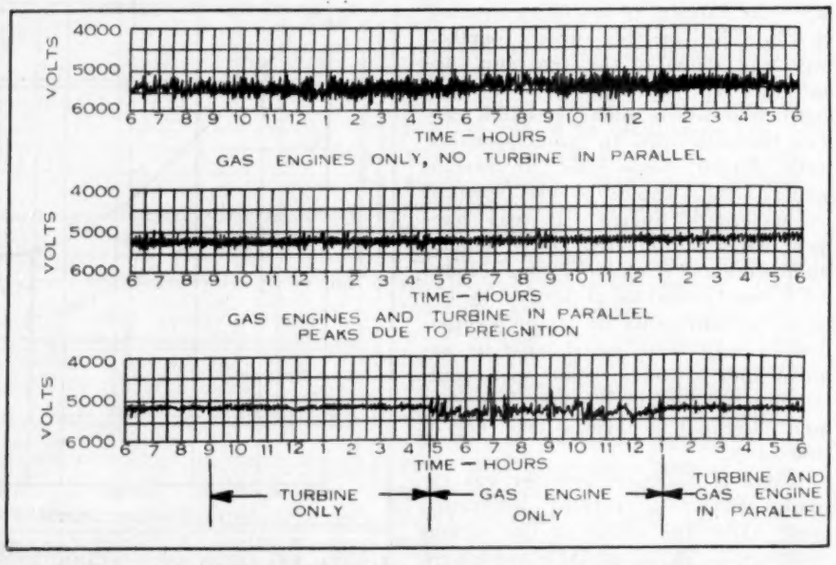
VOLTS
4000
5000
6000
6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6
TIME — HOURS
GAS ENGINES ONLY, NO TURBINE IN PARALLEL
GAS ENGINES AND TURBINE IN PARALLEL
PEAKS DUE TO PREIGNITION
TURBINE ONLY
GAS ENGINE ONLY
TURBINE AND GAS ENGINE IN PARALLEL

FIG. 16—VOLTAGE REGULATION OF AN ALTERNATING CURRENT STATION

is generally conceded by gas engine builders here and abroad, that the costs of maintenance, repairs and operation of a gas engine power plant are higher than those of a steam turbine power plant, the difference of costs increasing with the capacity of the plant in favor of the steam turbine system.

Heat Units Required and Load on Generator

Frequently it is stated here, and in Europe, that the steam turbine requires twice as many heat units per kilowatt hour as the blast furnace gas engine. This is true only for machines of no recent design and for full load of the gas engine unit. In other words, it is claimed by gas engine enthusiasts that it is possible to generate twice the amount of kilowatt hours with blast furnace gas engine units as with steam turbine units. It is further announced that if steam turbines alone are to supply the same amount of kilowatt hours as the gas engine units, a sufficient amount of coal has to be purchased to cover the other half of the heat units required in the case that blast furnace gas is not abundant.

The supposed better thermal efficiency of the blast furnace gas engine unit of twice that of a steam turbine equipment is the strong-hold of the gas engines, while all other advantages are in favor of the steam turbine equipment. But this stronghold becomes weaker as more gas engine units must be operated at light loads so that they can take care of the maximum energy demands on the line. However, under certain load conditions the position of gas engine units can be fortified if steam turbine units of suitable over-load type form a proper part of the generating equipment.

For such investigations, curves are of the utmost importance which show the relation of load in kilowatts at the alternating current generator to heat-units required at the prime mover to generate one kilowatt hour at a particular load. Only such curves can detect whether, for a certain load, blast furnace gas engines or steam turbines or a mixed system of gas engines and steam turbines are most advantageous from the standpoint of thermal efficiency. When dealing with steam turbine equipments due allowance must be made for the losses in the boilers. The data published on the heat units required by blast furnace gas engines are scarce, probably due to the difficulty of making reliable tests of this nature. It seems also that there are very few installations here as well as abroad in which a record of the consumption of gas and its heat value is kept continuously as derived from meters of unquestioned precision. The writer has resorted to European, mainly German, practice for information since their efficiencies range among the highest obtained. Fig. 12 shows the relation of load on the alternating current generator to the heat units required to generate one kilowatt hour. Curves *a*, *b*, *c*, *d*, and *e* pertain to blast furnace gas engines of very reputable make. They illustrate that the increase of heat units required per one kilowatt hour with the decrease of load is very considerable. The curves *f* and *g* represent similarly the consumption of heat units of steam turbines for steam at 635 degrees Fahr. temperature, and 185 pounds per square inch pressure, and for a vacuum of 29 inches. The tendency in the recent years has been to improve the thermal efficiency of steam turbines by using highly superheated steam at high pressures. The results have been very remarkable, and at present the limits of steam temperature and pressure are approximately 662 degrees Fahr., and 192 pounds per square inch respectively. Information on hand of large turbines for such steam conditions shows that still less heat units are required per kilowatt hour. It should be mentioned that curve *g* is based on tests made several years ago on 4,000 kilowatts unit (made by A. E. G., Berlin) in the well-known power station, Berlin-Rummelsburg. The data for the foregoing curves were derived as follows: *a* from *Stahl und Eisen*, 1911, No. 25; *b* from Compte rendu des Seances du 54. Congres des Ingenieurs en chef des Associations de Proprietaires d'Appareils a vapeur, Paris, 1910; *c* from *Stahl und Eisen*, 1913, pp. 1020; *d* from *Stahl und Eisen*, 1913, pp. 1306; *e* from *Stahl und Eisen*, 1913, pp. 1400; and *g* from *Stahl und Eisen*, 1912, No. 18.

For curves *f* and *g*, a boiler efficiency of 76 per cent has been applied which is an average value and taken for reasons of simplicity. The objection might be made that an efficiency of 76 per cent of a gas-fired boiler is too high. Actual tests, made by Ortman (Voelklingen), on boilers 20 years old, equipped with new burners, show an efficiency of 77 to 83 per cent (*Stahl und Eisen*, 1913, pp. 1399 and pp. 1901). From other trials in the works of the Coltness Iron Co., Ltd., an efficiency of 82 per cent was determined on gas fired boilers without superheaters and economizers (*Stahl und Eisen*, 1913, pp. 1898). As to gas-fired boilers in the United States, it is said by a well-known authority that the average efficiency is above 70 per cent with a well-set modern water tube boiler and suitable gas burners. From this data it can be assumed that a boiler efficiency of 76 per cent is reasonable for installations when efficiently managed.

Under the stimulation of the rivalry of the steam turbine with its increased thermal efficiency, splendid work has also been done in recent years to increase the output and efficiency of the blast furnace gas engine. This has been accomplished by the scavenging and surcharging processes and by utilizing the exhaust gas. At present there is, to the writer's knowledge, one installation under construction in Germany in which the scavenging and surcharging processes are applied and also the exhaust is used to generate steam for the turbo-blower necessary for such an arrangement (see paper in *Stahl und Eisen*, 1913, pp. 1,301). In this paper guarantee figures of such an equipment with steam turbine drive of the blower are given which might be cited as the best obtainable data at present. While the thermal efficiency of the gas engine is improved and the output increased by 37 to 39 per cent, it must be borne in mind that the decrease of installation cost per kilowatt will be offset partly by the additional other costs of boilers, blower, etc. Furthermore, the operating costs must increase. Curve *a*, of Fig. 13 (derived from the reference quoted) shows

Table IV.

RELATIVE ECONOMY OF GAS ENGINES AND TURBINES

Load.	B. T. U. per K. W. Hour		Ratio of B. T. U.'s
	Gas Engine	Steam Turbine	Used
Full rated load	11,800	17,800	1:1.51
¾ load	12,150	17,700	1:1.455
½ load	15,000	17,600	1:1.172

the relation of heat units per kilowatt hour to the load on the generator for a 3,000-kilowatt unit.

A few years ago a new type of boiler was brought on the market in England and on the European continent, namely, the so-called "incandescent surface combustion" type (inventors—Bone-Schnabel). Independent trials with boilers have shown efficiencies of from 93 to 96 per cent. It is learned that they have been in successful operation for over a year in the works of the Skinninggrove Iron Works, England. Applying such boilers in connection with steam turbines, curves *b*, *c* and *d* (the latter derived from Stodola, "Steam Turbines," 1910, pp. 402) are obtained for similar steam conditions as for turbines, in Fig. 12, and show the relation of heat units per kilowatt hour to load on the turbo-generator. These curves, *b*, *c* and *d*, are based on an average boiler efficiency of 93 per cent, and are intended to show the feasible relation of heat units required to load for good steam turbine equipments with surface combustion boilers, and for gas engine plants with scavenging and surcharging processes and the utilization of the exhaust. Thus a fair idea can be formed as to what might be expected in this field in the future.

Considering the curves of Fig. 12 in relation with a very variable electric energy demand on the line, which is present continuously in steel mills, it will readily be seen that the gas engine proposition cannot be the most economical (thermally) for all load conditions which must be met in order to supply power at good frequency and voltage. The curves *d* and *g* of Fig. 12, represent first class equipments and hence a fair comparison may be based on these curves.

First of all the thermal efficiencies of the gas engine and steam turbine equipments do not form a ratio of 2 to 1, but approximately 1.71 to 1 at full load of the generating units, and 1.2 to 1 at half load. These relative figures, when referred to curves *g* and *e*, are approximately 1.7 to 1 at full load, and 1.056 to 1 at half load. This simple comparison illustrates that for certain extreme load conditions (low load-factor) the thermal efficiency of the steam turbine equipment is by no means over-shadowed by that of the gas engine. But for average load conditions, usually met with in steel mill power plants, it will be very advantageous to improve the high consumption of heat units, as required by gas engines at light loads by using steam turbines with nozzle regulation, as obtained for curve *g* of Fig. 12. While this is not the place to demonstrate in detail at what load factors it is advisable to provide only gas engines, or only steam turbines, or by what amount of steam turbine capacity the gas engines can be enabled to operate at most economical load, a brief calculation will show the usefulness of properly designed steam turbines, as indicated in Fig. 12. A steel mill power system may have a peak of 20,000 kilowatts and a mean load over a 24-hour period of 11,000 kilowatts, resulting in a load factor of 0.55. Installing 2,200 kilowatt gas engines, nine generating units (20,000 $\div$ 2,200 = 9) must be in operation while in the case of a steam turbine equipment with 4,000 kilowatt units of maximum rating five generating sets will be required (20,000 $\div$ 4,000 = 5). The mean load will be 11,000 $\div$ 9 = 1,220 kilowatts on each gas engine unit which requires approximately 18,200 B. T. U. per kilowatt hour under these load conditions. The mean load on each steam turbine unit will be 11,000 $\div$ 5 = 2,200 kilowatts and since each turbine demands approximately 22,600 B. T. U. per kilowatt hour at that mean load, it will require approximately 4,400 B. T. U. (22,600 — 18,200) more than the gas engine unit.

Table V.

OPERATING DETAILS OF GERMAN POWER PLANTS

Name of plant.	Capacity of plant load.	Character of load.	Type of prime mover.	Average calories used per K. W. hour.	Average B. T. U. used per K. W. hour.	Average thermal efficiency	Remarks and reference.
Georgsmarienhuette	4,000	Steel mill load.	Gas engines	Exceeding 4,400	Exceeding 17,450	Less than $\frac{3,415 \times 100}{17,450} = 19.55$ per cent	Flywheel set and roll motors Stahl und Eisen, 1911 No. 49
Duedelingen	.....	Steel mill load.	Gas engines	4,500	17,850	$\frac{3,415 \times 100}{17,850} = 19.1$ per cent	Stahl und Eisen, 1911 No. 25
Maerkisches Electricitaets-Werk	8,000	Lighting and considerable industrial motor load	Steam turbines with nozzle regulation	6,000 to 6,300 average 6,150 per year 1911	23,800 to 25,000 average 24,400 per year 1911	$\frac{3,415 \times 100}{24,400} =$ 14 per cent per year 1911	Electrotechnische Zeitschrift 1912, No. 34, pp. 882
Louisenthal	19,500	Mining and industrial load	Steam turbines	6,300 over 5 years	25,000 over 5 years	$\frac{3,415 \times 100}{25,000} = 13.63$ per cent over 5 years	Stahl und Eisen 1913, No. 51 Louisenthal plant operates in parrallel with Heinitz plant. Steady load predominates on the gas engines in Heinitz while turbines in Louisenthal take peaks
Heinitz	13,000		Coke oven gas engine	3,750 to 4,000 average 3,875	Average 15,400	$\frac{3,415 \times 100}{15,400} = 22.2$ per cent	
Municipal power plant	.....	Lighting and small street car system	Steam turbines	5,800 per winter month	23,000 per winter month	$\frac{3,415 \times 100}{23,000} = 14.81$ per cent	Fairly steady load, Stahl und Eisen, 1913 No. 51

For 310 working days and a mean load of 11,000 kilowatts prevailing during that time, the total kilowatt hours generated are 82,000,000. Allowing for two spare units, each of 2,200 kilowatts maximum rating, a yearly use-factor of 38.65 per cent and a daily use-factor (full working day) of 45.5 per cent is obtained. If, however, steam turbines of the over-load type and of similar characteristic as shown in Fig. 15 are applied, their rating will be only $4{,}000 \div 1.5 = 2{,}660$ kilowatts and they will have an aggregate capacity of 15,960 kilowatts for the same load conditions, including a spare capacity of 2,660 kilowatts or 4,000 kilowatts maximum rating. Such a steam turbine plant will operate at a yearly use-factor of 58.5 per cent and at a use-factor for a working day of 68.3 per cent, as compared with 38.65 per cent and 45.5 per cent attained with the gas engine equipment. Assuming, under the worst conditions, no blast furnace gas is available in excess of that required for the 82,000,000 kilowatt hours, 4,400 B. T. U. per kilowatt hour will have to be purchased in the form of coal in case of the steam turbine installation. This means $82 \times 10^6 \times 4{,}400 = 361 \times 10^9$ B. T. U. per year, or $361 \times 10^9 \div 13{,}000 \times 2{,}240 = 12{,}400$ gross tons of coal of 13,000 B. T. U. per pound. On the basis of $2.50 per gross ton, $31,000 have to be spent for coal and are to the credit of the gas engine equipment. Considering now only the first costs of investment of all other items in favor of the steam turbine, and basing the same on $100 per kilowatt for the gas engine, and on $70 per kilowatt for the steam turbine, $2,420,000 ($24{,}200 \times \$100 = \$2{,}420{,}000$) must be spent for the gas engine plant and $1,680,000 ($24{,}000 \times \$70 = \$1{,}680{,}000$) for the steam turbine plant. For a fixed charge of 13.5 per cent (7.5 per cent depreciation, 5 per cent interest, and 1 per cent insurance and taxes) the yearly expense for this item is approximately $327,000 for the gas engine equipment, and $227,000 for the steam turbine plant, resulting in a credit to the steam turbine plant of $100,000 per year. The difference between $100,000 and $31,000 (coal cost) equals $69,000 and is the minimum actual saving per year with steam turbine equipment at the load conditions outlined.

Another solution of this problem might be approximated as follows for similar load conditions as above, viz.: Peak on line, 20,000 kilowatts; mean load over 24 hours, 11,000 kilowatts. The minimum demand may be 7,000 kilowatts. Five 2,200-kilowatt gas engines may be installed, four of which will be in operation and so governed as to take the bulk load of the 7,000 kilowatts and will participate in the load up to 8,800 kilowatts. The load on each gas engine will then vary between 2,200 kilowatts and $7{,}000 \div 4 = 1{,}750$ kilowatts. The average load will be approximately 1,975 kilowatts, at which 13,700 B. T. U. per kilowatt hour are required, as against 18,200 B. T. U. if gas engines only are installed. In addition to the five gas engines, four steam turbines, one of which will be a spare unit, may be installed, each with a nominal rating of 2,500 kilowatts and of an over-load rating of 3,750 kilowatts. The load from 8,800 kilowatts to 20,000 kilowatts equals 11,200 kilowatts and must be handled by three steam turbines, which answer the purpose since their aggregate over-load capacity amounts to 11,250 kilowatts. Their average load is low, approximately 42 per cent of the nominal rating of the turbines, and approximately 25,100 B. T. U. (22,600 plus 11 per cent of 22,600) per kilowatt hour are required at that load. The heat balance for a working day is given in Table III. Utilizing the 3.435×10^6 B. T. U. in steam turbines of somewhat larger units than 2,500 kilowatts nominal rating, and selling the gained electric energy to an outside party with a net profit of $0.005 per kilowatt hour, the following sum may be earned on the basis of 24,500 B. T. U. per kilowatt hour and at 310 working days:

$$S = \frac{343{,}500{,}000 \times 310 \times 0.005}{24{,}500}$$

$$S = \$21{,}750.$$

The capital invested for such a power plant of five gas engines and four turbines is, at the same specific figures of $100 and $70 per kilowatt, equal to $5 \times 2{,}200 \times \$100$ plus $4 \times 3{,}750 \times \$70$ or $2,150,000, and requires a yearly expenditure for fixed charges (13.5 per cent) of $290,000. The difference between $290,000 and $327,000 for a straight gas engine installation, equal to $37,000 per year, must be credited to the former to which sum also $21,750 for the sale of electric energy must be added, giving a net saving of $58,750 per year.

Without going into minute calculations, it will readily be seen that for the load conditions outlined (load-factor 0.55) the turbine prime mover plant is usually financially the best, followed first by the mixed prime mover system and then by the straight gas engine plant.

In the above comparison of the three systems, specific costs for maintenance, repairs, lubricants and water are not included for the sake of simplicity. If they were introduced in the above balances, the financial exhibits of the straight turbine plant and of the mixed prime mover system would show up still better, while the balance of the straight gas engine plant would become more negative.

Future Possibilities

In looking ahead for what possibly may be realized in applications to variable load, first with gas engines using the scavenging and surcharging processes and utilizing the exhaust, and second, with first class steam turbines with highly superheated steam and Bone-Schnabel boilers, Fig. 13, we find that, under these fair comparable conditions, the steam turbine will improve its standing from an economical viewpoint. Comparing curves *a* and *d*, Table IV, results.

Minute balances of heat units required by gas engines as well as steam turbines can, of course, be studied only and determined on the basis of load diagrams in connection with specific curves, as for example, curves of Fig. 12. Only such balances combined with exhibits involving costs of installations of repairs, maintenance and operations, can ultimately show whether the gas engine, or the steam turbine, or the mixed system of gas engines and steam turbines is the best from the financial view and from the point of satisfactory service. There can be no doubt that the steam turbine must gain ground with the greater difference between average load and maximum energy demand or, in other words, with the smaller load factor.

Roll Motor and Generator Capacity

It remains to be shown that the above considerations with reference to gas engines and steam turbines in steel mill power plants have found application in a great many mills, particularly in Europe and in mills of German concerns. During a recent visit, the writer found that, in mills with roll train load, there is a certain amount of steam turbine capacity attached to gas engine power plants, the steam turbine capacity varying from approximately 25 to 30 per cent of the total power plant capacity. Furthermore, several power plants have been built in recent years equipped only with steam turbine driven generators.

For any new power plant it is rather difficult to estimate the generator capacity necessary to cover the energy demands of certain connected loads due to their diversity. For

(*Continued on page* 131.)

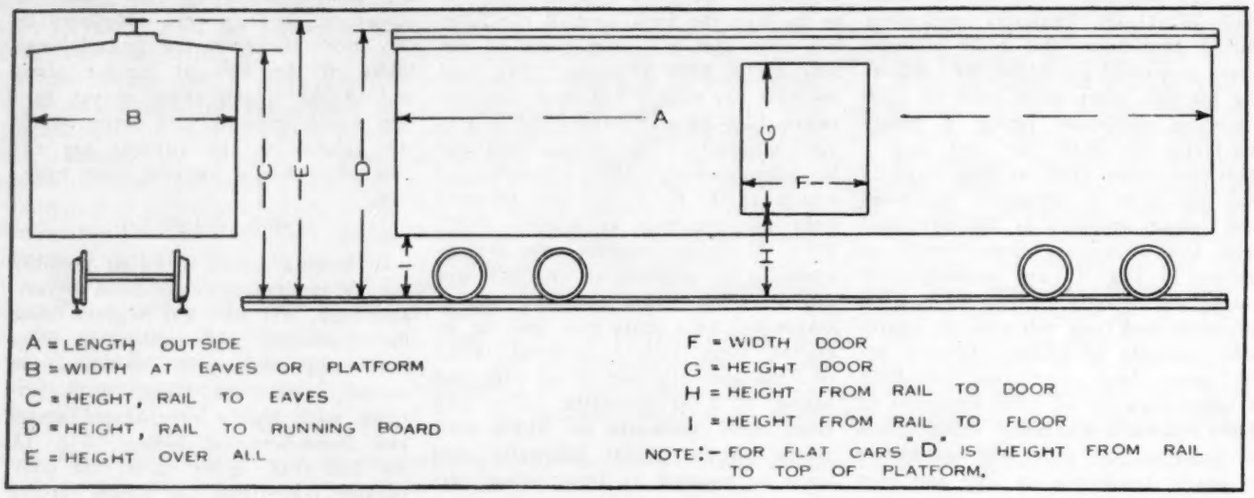

Diagram of Freight Car Measurements

Allowing Proper Car Clearances

The Table and Diagram Show the Principal Overall Dimensions of American Freight Cars

The accompanying table and diagram show the principal over-all dimensions of various types of freight cars on American railroads. It is essential that designers of mill buildings, steel warehouses and other structures know these dimensions in order to provide proper clearances. Cases have arisen where costly alterations to completed structures were necessary in order to provide for the entry of cars of large size.

TABLE SHOWING PRINCIPAL DIMENSIONS OF FREIGHT CARS

Road—Type car.	A Ft. In.	B Ft. In.	C Ft. In.	D Ft. In.	E Ft. In.	F Ft. In.	G Ft. In.	H Approx. Ft. In.	I Approx. Ft. In.	Capacity, cu ft.	Capacity, pounds.
Pennsylvania; Box.....	36 4	9 10½	11 8	12 4½	13 0⅛	5 4	6 7¾	3 11	3 6	1,981	60,000
Pennsylvania; Produce.....	38 6	9 10	12 0½	12 8½	13 9	4 2	6 1¾	. ..	. ..	2,091	100,000
Pennsylvania; Furniture.....	41 11¼	9 11¾	12 3¼	12 10⅜	13 6¾	6 6	8 0	2 6	3 4	2,923	60,000
Pennsylvania; Furniture.....	36 4	9 10¼	11 7½	12 4⅜	12 10¼	5 4	6 7¾	. ..	. ..	1,981	80.000
Pennsylvania; Automobile....	38 6	9 6¼	12 7⅜	13 4 1/16	13 10 1/16	12 2	8 4½	. ..	. ..	2,650	100,000
Pa.; Gondola bottom hopper.	33 0	10 1½	.. ...	3 6	10 7¼	. ..	. ...	. ..	. ..	1,672	100,000
Pa.; Flat	40 2	9 3	.. ...	3 10⅛	6 7⅜	. ..	. ...	. ..	. ..	371	100,000
Pa.; Gondola long.....	52 0	9 10¾	.. ...	3 4⅜	7 3⅛	. ..	. ...	. ..	. ..	1,452	140,000
Pa.; Box	38 6	9 10	12 0¼	12 8⅝	13 2⅜	6 0	7 5¼	. ..	. ..	2,448	100,000
N. Y. Central; Box.....	34 0	9 3¾	10 6½	11 4¼	13 1½	5 0	5 9½	4 0	3 6	1,670	50,000
N. Y. Central; Refrigerator..	37 5	9 6	12 1	12 10	14 0	5 0	5 10	. ..	. ..	1.707	50,000
N. Y. Central; Stock.....	37 0	9 8	11 7½	12 4	13 5	5 0	6 9	. ..	. ..	2,142	60,000
Lehigh Valley; Automobile..	43 9¼	9 8⅝	12 7⅜	13 4⅝	13 9½	12 0	8 2¾	. ..	. ..	2,950	60,000
Lehigh Valley; Box.....	34 10¼	9 4½	11 6	12 3	12 11⅛	5 7½	7 0½	. ..	. ..	1,904	60,000
Lehigh Valley; Carriage.....	46 5	9 8¾	13 0	13 9¼	14 1	8 8¾	8 6½	. ..	. ..	3,040	40,000
Lehigh Valley; Stock.....	38 2	9 5½	12 0	12 9	13 6	5 3¼	7 5	. ..	. ..	2.406	50,000
Lehigh Valley; Gondola, wood	35 0½	. ...	5 0	.. .	6 8	. ...	. .	. ..	. ..	227	40,000
Lehigh Valley; Cinder.....	36 0	. ...	7 11	.. .	6 6½	. ...	. .	. ..	. ..	1,273	80,000
Erie; Furniture	50 7¼	9 10⅛	13 10⅜	14 7⅜	14 7⅜	10 0	9 5	. .	. .	4,532	80,000
Erie; Box	34 8¾	9 3½	11 7¾	12 7	13 3½	5 7	6 5	4 2	3 4	1,927	60,000
D. L. & W.; Box.....	34 10½	9 4	11 7	12 3	13 1	5 6	6 8½	. .	. .	1,913	60,000
D. L. & W., Stock, dbl. deck	36 10½	9 5½	12 1	12 9	13 5½	5 0	3 3	. ..	. ..	2,327	60,000
D. L. & W., Hopper.....	30 9	10 1	10 0½	.. .	10 8	. .	. .	. ..	. ..	1,680	100,000
Cent. R. R. of N. J.; Box..	34 10	9 7	11 7	12 5	12 10	5 6	6 6	. ..	. ..	1,994	60,000
Cent. R. R. of N. J.; Refrig.	34 3	9 8	12 4	13 1	13 8	5 0	5 9½	. ..	. ..	1,747	40,000
B. & O.; Furniture.....	40 6	9 6¼	12 3⅛	13 0¼	13 9⅜	6 0	7 11¼	3 6	3 1	2,321	50,000
Pere Marquette; Box.....	40 0	9 11	12 0	12 3	13 0	5 10	7 4	. ..	. ..	2,562	50,000
Rock Island; Furniture.....	51 6	9 10	13 4	14 0	14 0	11 10	8 10	. ..	. ..	4,037	60,000
Rock Island; Gondola, steel.	38 0	10 1	.. .	.. .	8 8	. ..	. ..	. ..	. ..	.....	100,000
Great Northern; Hay.....	33 0	9 2	12 0	12 9½	12 10½	5 0	7 4	4 1	3 3	1,983	40,000
North'n Pacific; Lumber....	41 0⅛	9 8½	.. .	13 3⅞	14 0½	5 6	8 3½	. ..	. ..	2,990	80,000
South'n Pacific; Automobile.	41 1 1/16	9 10	14 0 13/16	14 11 13/16	15 6 7/16	9 8½	9 5½	. ..	. ..	3,670	100,000
South'n Pacific; Box.....	41 10	10 0	13 3 1/16	14 1 13/16	14 7¾	6 0	8 8⅜	. ..	. ..	3,370	100,000
Atchi., Top. & S. Fe.; Furn.	34 0	9 10	11 7	12 1½	13 8	5 2	6 7	. ..	. ..	.....	50,000
A., T. & S. Fe.; Coal & Coke	34 0	9 10	12 2½	11 10	13 3	. ..	. .	. ..	. ..	.....	44,000
Mo., Kas. & Tex.; Refrig...	42 4½	9 9½	12 1¾	12 10½	14 0	4 0	6 2	. ..	. ..	1,972	60.000
Norfolk Western; Box.....	36 1	9 6½	11 5⅛	12 4⅛	13 3½	5 6	6 3½	. ..	. ..	1,896	50,000
Norfolk Western; Flat.....	33 6	8 3½	4 4¼	7 1½	.. .	. .	. .	. ..	. ..	278	50.000
Norfolk West'n; Coke, Steel	42 0	10 0	13 6	.. ...	13 6	. .	. .	. ..	. ..	3,458	100,000
Merchant Despatch; Refrig..	36 1¾	9 9	12 2¾	13 1	14 1½	5 0	5 8¼	4 2	3 6	1,829	60,000
Canadian Pacific; Horse.....	47 1⅜	9 8½	12 7½	13 3½	13 3½	5 0	6 9	. ..	. ..	2,036	24,000
N. Y., N. H. & Hartford; Auto.	38 6	9 7	12 6⅝	13 2	13 10	6 0	7 9	. ..	. ..	2,448	80,000
Boston Maine; Ice.....	37 1	9 4	12 7⅜	.. ...	13 11⅝	5 8	7 7	. ..	. ..	2,371	60,000
Boston Maine; Grain.....	36 9⅜	9 7⅜	12 0	13 3¼	13 11⅝	6 0	7 10⅜	. ..	. ..	2,460	60,000
Max. dim. taken fr. dif. cars.	60 11⅜	10 7	14 11¼	15 7¼	15 7¼	12 2	9 10	4 2	. ..	.....	110,000

Bar Mill for Agricultural Work

Details of Mill of Large Capacity Erected at Minimum Cost by the Wisconsin Steel Co. —Designed to Roll ¼-inch Rounds from a 4 x 4-inch Billet Without Reheating

FOR some time past the International Harvester Co. has been a heavy purchaser of small steel bars used in manufacturing agricultural implements. The Harvester interests control the Wisconsin Steel Co., which operates an extensive Bessemer steel plant and rolling mills at South Chicago. The output of these mills, however, has been insufficient to supply even the western requirements of the Harvester company. Eventually, however, it is the intention of the owners of the Wisconsin Steel Co. to so extend its operations that it will be practically unnecessary to purchase any rolled products in the open market in the west. As another step in this direction, a new bar mill has recently been added to the existing facilities at the South Chicago steel plant. This new mill, known as merchant mill No. 4, is laid out for an ultimate capacity of 6,000 tons per month and is so arranged that a ¼-inch round can be rolled from a 4 x 4-inch billet without reheating. In fact, only one reheating is required in reducing a 5,000-pound ingot to a ¼-inch round.

The new mill, which is located west of merchant mill No. 2, occupies a building 370 feet long and 84 feet wide with an engine room and roll shop in a lean-to on the east side 35 feet wide and 180 feet long. The equipment includes a specially designed, coal fired, continuous heating furnace which discharges the reheated billets onto a table leading to a four-stand 14-inch continuous roughing mill. The latter is followed by two stands of 16-inch rolls, five stands of 12-inch rolls and two stands of 8-inch rolls. The pieces double back through the 16-inch mill, there being 15 passes in all in rolling a ¼-inch round from a 4 x 4-inch billet. The various roll trains are driven from a single engine belted to several jack shafts as shown in Fig. 2, which indicates the general arrangement of the mill.

The cooling bed, furnished by The Morgan Construction Co., Worcester, Mass., is 178 feet 4 inches in length, this being the maximum in the space available. The limitations of the cooling bed make it necessary to provide arrangements for rolling very short billets. For this reason a 4 x 4-inch hydraulic hot shear is located between the heating furnace and the continuous mill and a 2 x 2-inch shear is situated in the run-out table of the same mill. Billets less than 2 feet long cannot be handled in the continuous furnace. A billet of this length weighs 108 pounds and when rolled to a ¼-inch round would be nearly 650 feet in length, more than three times the length of the cooling bed. The 24-inch billets are, therefore, rolled to 2 x 2 inches in the continuous mill and then cut to lengths of about 2 feet 1½ inches to form the required 175 feet of ¼-inch round, which weighs approximately 29.2 pounds.

In addition to ¼-inch rounds, the new mill rolls ⅜-inch small flats, wagon box strips ¾ inch wide and No. 13 gage in thickness, ½ x ⅛-inch flats, ⅝ x ⅛-inch flats, 7/16 x 5/32-inch ovals, and also what is known as a Harvester bar, which is virtually a 4½ x 1-inch angle with an additional leg 1 5/16 inches in depth. The weight of this bar is 4.85 pounds per foot.

FIG. 1—NEW MILL, SHOWING 16-INCH STANDS AT THE RIGHT AND COOLING BED ON THE LEFT

Plans and sections of the continuous heating furnace are shown in Figs. 5 and 7. The heating chamber is 10 feet in width and 45 feet in length, the overall dimensions of the furnace being 68 feet 3¼ inches by 15 feet 7 inches. The billets are carried on water-cooled skids in the usual manner. The furnace is equipped with a gravity discharge of the usual Morgan type, modified to fit the requirements of the fuel used. Bituminous coal screenings from Illinois and Indiana mines are fired with a Jones underfeed stoker equipped with an automatic ash cleaning device.

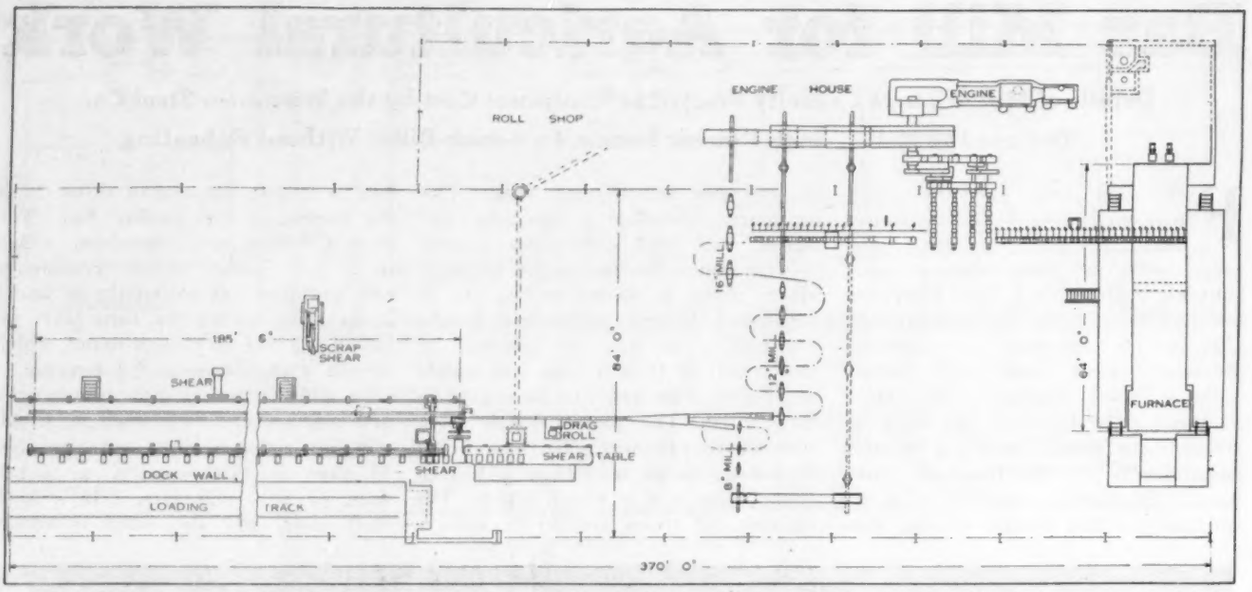

FIG. 2—GENERAL LAYOUT OF WISCONSIN STEEL CO. BAR MILL

In order to have the grates below the hearth line and the hearth of the furnace as close to the fire bed as possible, the discharge is arranged with a compound or reversed incline.

The billet rolls off the hearth in the usual manner and strikes a water cooled baffle plate, which delivers it to the roller table situated underneath the furnace. This arrangement is clearly shown in Fig. 5. The slope of both parts of the incline is 1½ to 1. The fire box is 8 feet 7 inches in length and 9 feet in width, the bridge wall between the fire box and the furnace proper being 8 feet 8¼ inches above the ground level. The walls of the furnace are 18 inches in thickness, consisting of 9 inches of fire brick and 9 inches of common brick. The roof is 9 inches in thickness arched to a radius of 15 feet 5 inches.

The billets are transferred from the cars on which they are brought from the blooming mill to the charging platform of the furnace by a 15-ton Alliance crane that serves the entire mill. The charging pusher is of the usual type and extends the full width of the furnace chamber, so that two rows of billets may be moved along the skids simultaneously. The furnace has been made unusually long, in part because of the firing arrangement, and also in the natural endeavor to utilize the heat through as wide a range of temperature as possible. As a result, a thorough and uniform heating of the billet is secured which contributes materially to the exceptional reductions accomplished in a limited number of passes through the roll trains.

The 14-inch continuous roughing mill was designed by the Wisconsin Steel Co. It is directly connected to the engine through a series of spur gears, which are arranged to accommodate the reduction in area and the increase in the length of the piece. The engine is designed to operate at either 50 or 90 revolutions per minute. At the former speed the piece travels through the first trains of 14-inch rolls at 25.9 feet per minute and through the fourth train at 81.5 feet per minute; with the engine

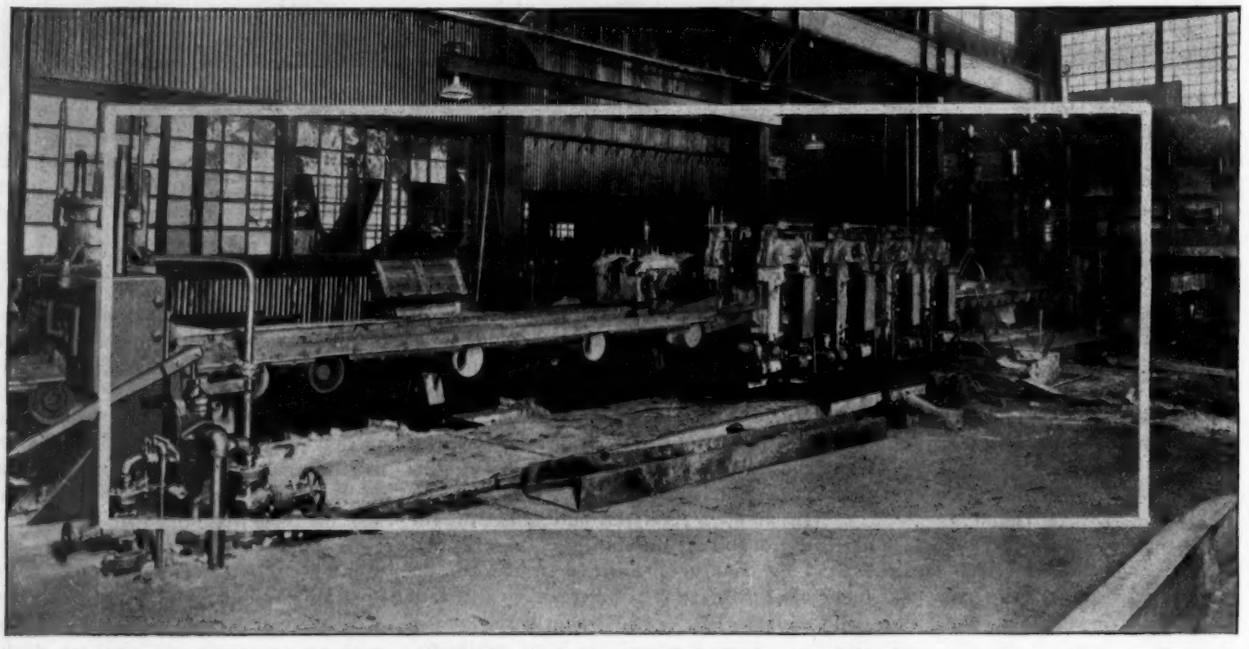

FIG. 3—CONTINUOUS MILL WITH TABLES AND SHEARS

operating at 90 revolutions per minute, the speed through the first train of rolls is 47 feet per minute and that through the fourth train is 140 feet per minute. When the piece emerges from the continuous mill, its length has been increased four times and its cross section reduced to 2 x 2 inches. The run-out table of the continuous mill leads straight to the first stand of 16-inch rolls, but before the billet enters the latter, it is sheared to the proper length in the 2 x 2-inch hydraulic hot shear, as explained above. The piece passes twice through each stand of 16-inch rolls and then loops back to the 12-inch mill.

Roll Changes Are Made Quickly

The mill was designed so that roll changes could be made quickly and easily in order to handle small tonnages economically. This feature is particularly prominent in the design of the 12-inch mill housings. They are arranged with an open top and straight side windows, which permit of three rolls to be lifted by the crane at one time. In order to prevent the rolls from getting out of line, which sometimes occurs with housings of this type, both top and bottom screws are provided and the middle roll bearing is screwed down against a plate inserted in a slot between the middle and the bottom rolls. This fixes the position of the middle roll and holds it in line. The plate may be easily removed when changing rolls. The housing cap instead of being bolted on, is held in place by a taper key. This arrangement is general for all of the housings in the mill. The pinion housings are of the closed type, designed so that the bearings run in an oil bath.

The two small 8-inch stands are shown at the extreme left in Fig. 1 and again in Fig. 4. They are driven through belts by a long 7-inch countershaft, which extends under the mill floor, as shown in Fig. 2. This shaft terminates in an 8½-foot pulley with a 2-foot 2-inch face. The pulley on the leading spindle of the mill is 3 feet 10¼ inches in diameter. The countershaft runs from 156 to 281 revolutions per minute, and the mill spindle, therefore, runs from 343 to 617 revolutions per minute.

The chute which leads from the delivery end of the mill to the cooling bed is so arranged that if desired the two 8-inch passes can be omitted. A motor driven drag roll is located in the chute about halfway between the 8-inch rolls and the receiving end of the cooling bed. The drag roll is operated by a 15-horsepower variable speed motor, which runs from 975 to 1,800 revolutions per minute. The normal speed of the piece issuing from the 8-inch rolls is 1,414 feet per minute. Skelp issues from the 12-inch mill at 919½ feet per minute.

FIG. 4—EIGHT-INCH MILL SHOWING BELT DRIVE UNDER FLOOR

Scrap Charged in Blast Furnaces

The cooling bed is of the standard Morgan incline step or rocking type. As mentioned above, it is 178 feet 4 inches in length, consisting of 108 20-foot racks. The overall width of the cooling bed is approximately 16 feet. The cooling bed is paralleled by a depressed loading track and is provided with a vertical shear for cutting to length. A shear is also installed for cutting left-over lengths into multiple sizes and a short alligator shear is used for cutting up scrap. The shears were furnished by the United Engineering & Foundry Co., Pittsburgh. The scrap is deposited in wooden boxes about 6 feet square which are handled by the traveling crane. The scrap is not sold, but is recharged into the blast furnaces.

The speeds at which the several mills operate, particularly the relative speeds of the four stands in the continuous roughing mill, are interesting.

Table I.

DETAILED FIGURES SHOWING THE REDUCTIONS OF A 4 x 4-INCH BILLET TO A ¼-INCH ROUND WITH ENGINE AT 90 REVOLUTIONS PER MINUTE

Pass No.	Area of pass in square inches.	Working diameter of rolls, inches.	Speed of piece feet per minute. Ft.	In.	Length of bar from 100 pound 4 x 4-inch billet. Ft.	In.
		14-Inch Continuous Mill				
1	9.73	12 5/8	...	.	..	.
2	6.63	12 11/16	...	.	..	.
3	4.25	12 3/4	...	.	..	.
4	2.79	13 1/8	140	1	10	6
		16-Inch Roughing Mill				
5	1.87	15 11/16	562	7	15	7
6	1.13	15 7/8	569	4	26	0
7	0.7522	15 3/4	564	10	39	2
8	0.44	16 5/8	596	2	67	6
		12-Inch Bar Mill				
9	0.313	12	882	6	93	11
10	0.19	12	882	6	154	8
11	0.1363	12¼	903	3	215	11
12	0.094	12 1/16	891	11	309	0
13	0.075	12 1/16	919	6	392	0
		8-Inch Finishing Mills				
14	0.06	7¼	1,166	0	490	0
15	0.049	8 25/32	1,414	0	600	0

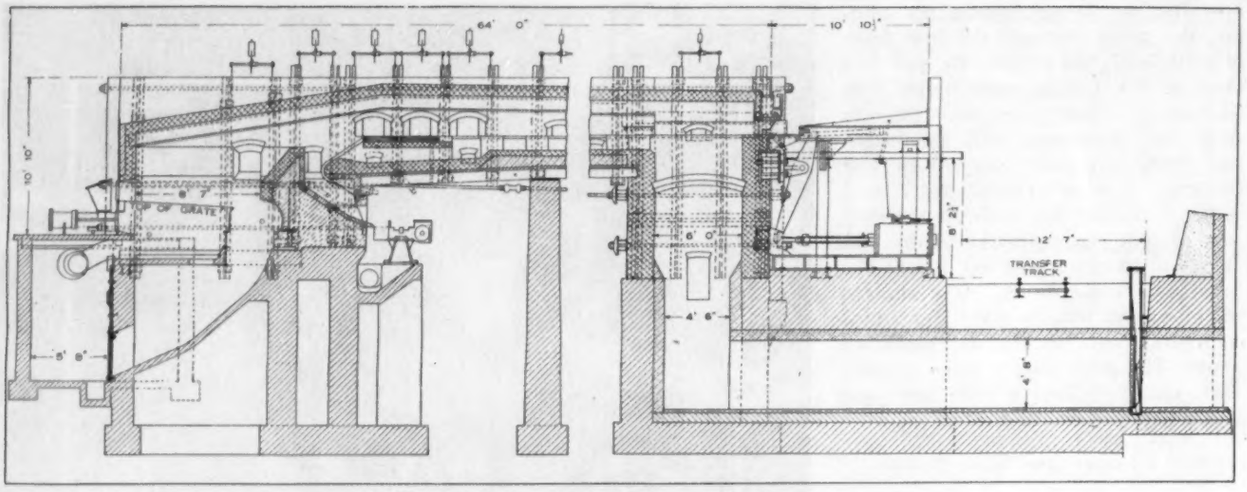

FIG. 5—VERTICAL SECTION OF CONTINUOUS HEATING FURNACE

in view of the rapid reductions in cross section. The following table gives the maximum and minimum speeds of the mill with the engine at 50 and at 90 revolutions per minute:

	Maximum and minimum speeds of the mills with engine at 90	50
	r. p. m.	r. p. m.
First set 14-inch mill.....	14.84	8.24
Second set 14-inch mill...	19.57	10.87
Third set 14 inch mill....	20.00	16.66
Fourth set 14-inch mill...	42.00	23.33
16-inch mill	137.00	76.00
12-inch mill	281.00	167.00
8-inch mill	617.00	343.00

The reduction in area, working diameter of rolls, speed of the piece in feet per minute and length of bar produced from a 100-pound 4 x 4-inch billet are given in Table I. This table is computed for an engine speed of 90 revolutions per minute when rolling ¼-inch rounds from 4 x 4-inch billets.

The entire mill is driven by a 34 x 54 x 60-inch tandem compound Corliss engine furnished by the C. & G. Cooper Co., Mount Vernon, O. As mentioned above, the 14-inch roughing stands are driven direct from the engine shaft through a train of machine molded gears. The 16, 12 and 8-inch mills are driven by belts through counter shafts. The engine pulley is 20 feet in diameter; the pulley on the leading spindle of the 16-inch mill is 13 feet 3 inches in diameter, while that of the leading spindle of the 12-inch mill is 7 feet 7 inches in diameter. The arrangement of the drive, together with the idlers which keep the belts tight is clearly shown in Fig. 9. The waste water from the condenser is piped around to the end of the mill approach table under the heating furnace and is used to flush the mill scale through a concrete flume to a scale pit adjacent to No. 2 mill. This flow of water added to the cooling water from the rolls is sufficient to carry even the heaviest scale away from the roughing stands. A small flume extends under the 12-inch and 8-inch mills where the water from the rolls is sufficient to wash down the scale.

The mill building is a steel frame structure with a Federal tile roof and heavy corrugated sheet steel siding. The lower half of the west wall is equipped with vertical sliding doors, so that the mill can be thrown open in good weather and tightly enclosed in bad weather. The steel work was fabricated by the McClintic-Marshall Co., Pittsburgh.

The roll shop, which is located adjacent to the engine room, is equipped with one 18-inch and two 26-inch motor-driven roll lathes, provided with enclosed gear drives. The larger lathes are equipped with two sets of housings for turning two rolls simultaneously. This shop serves only the No. 4 mill and is operated as an auxiliary to the main roll shop.

The engineering for the mill was done by the staff of the Wisconsin Steel Co. under the direction of George E. Rose, general superintend-

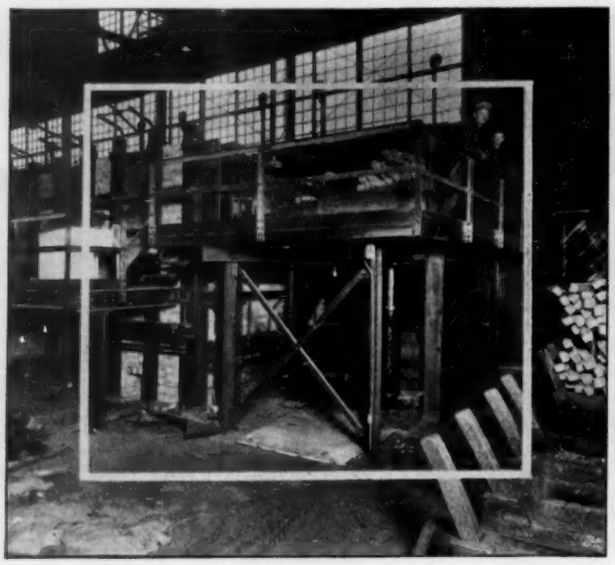

FIG. 6—CHARGING END OF HEATING FURNACE

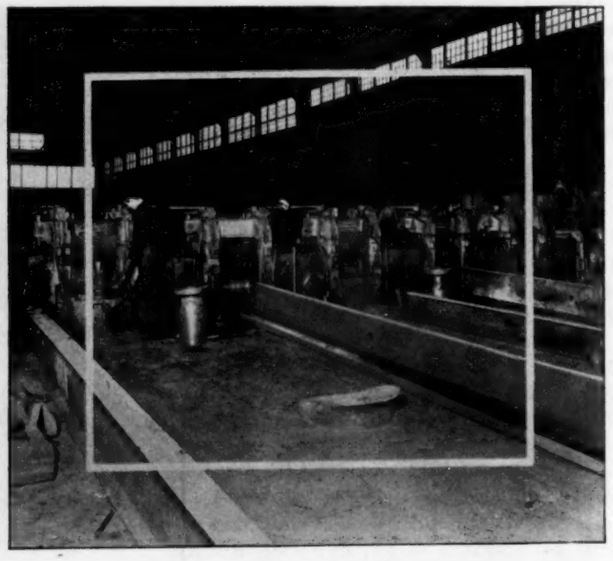

FIG. 7—TWELVE-INCH MILL

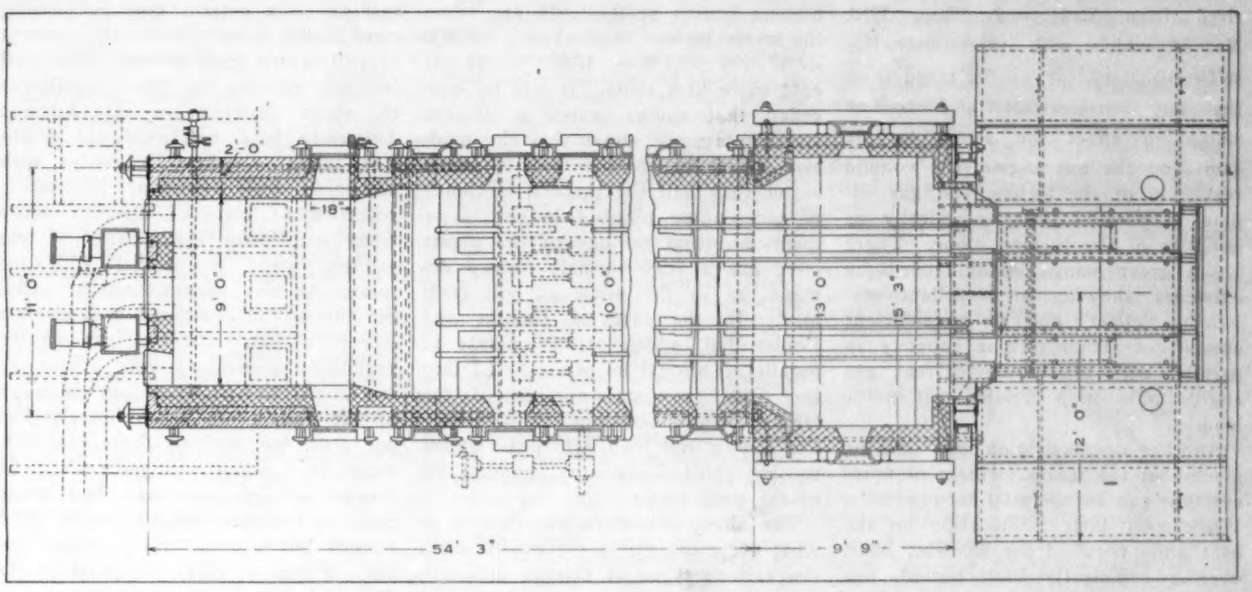

FIG. 8—HEARTH PLAN OF CONTINUOUS HEATING FURNACE

ent and E. V. Leonhauser, chief engineer. The mill was built by the United Engineering & Foundry Co., Pittsburgh.

Power Questions in Steel Mills

(*Continued from page* 125.)

ordinary power plants carefully established statistics indicate the load to be expected for a certain type of industry, kind of population, etc. For steel mill power plants very few statistics have been published. There is no doubt that, for average conditions, the influence of roll motors prevails, forcing upon the line a certain characteristic energy demand. For this reason, the establishment of the relation of roll motor capacity of the plant to the kilowatt per horsepower rating of roll motor, including lighting and auxiliaries of the plant, is justifiable. Such a relation is laid down in Fig. 14, comprising two curves, one for gas engines and one for steam turbines, their combined ordinate giving the total specific kilowatt generator capacity per 1 horsepower rating of roll motors. These curves are based on statistics from European mills, and serve to show that 25 to 30 per cent of the total generator capacity is made up of steam turbine units. Attention should be given to the left-hand part of the curves which indicates that the smaller the aggregate rating of roll motors the greater, proportionately, the generator capacity must be. This invariably holds true, since in mills with a few roll train motors, the number of reserve generating units is greater and the use-factor lower than in plants with a considerable number of roll motors. The load-factor also is smaller. Such curves naturally can indicate average conditions only. A study shows that in some cases power plant capacity and roll motor capacity or total connected load is a discontinuous function entirely. Furthermore, the question of roll motor rating is another chapter. In those steel mill power plants in which steam turbines only are installed, all points of specific generator capacity are even below the curve for gas engines. These points are not plotted in Fig. 14, but they serve to prove also that the total rating of generating capacity can be considerably smaller if steam turbines of proper type are selected. Attention is called to Fig. 16, de-

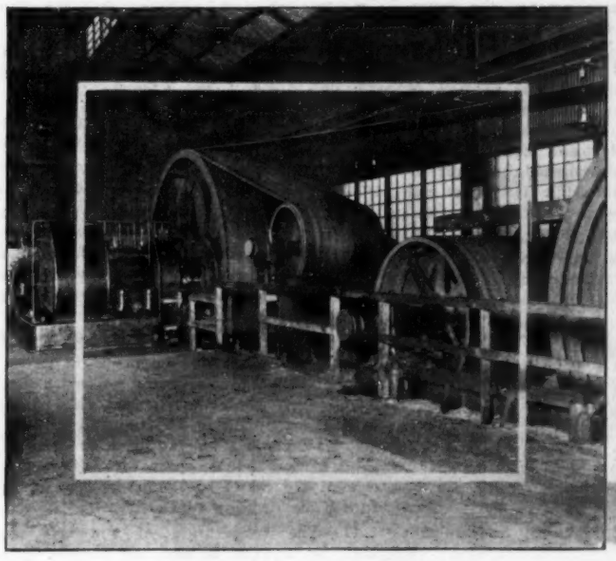

FIG. 9—ENGINE AND BELT DRIVE

FIG. 10—MORGAN COOLING BED

rived from *Stahl und Eisen*, 1913, No. 34, which, with its notations, is self-explanatory. It will be noted from the last curve what an excellent stabilizing effect the steam turbine exerts on the gas engine, the voltage regulation of the turbine and gas engine in parallel being practically as good as of the turbine alone. There are a great many similar records in existence showing an excellent stabilizing effect due to a sufficient amount of steam turbine capacity in parallel with alternating current gas engine units on a variable roll motor load.

Another demonstration will now be given that the steam turbines of modern type can be operated economically. While very little information on the heat units required per kilowatt hour, over a sufficiently long period, has been published, the writer has compiled in Table V some figures available in the German literature. This table shows the number of heat units required per kilowatt hour for gas engines and modern steam turbine equipments for periods of from one month up to five years. From these figures it will be seen that the steam turbine demands (23,000 — 15,400) 100 ÷ 15,400 = 49.7 per cent more heat units only than the gas engine if the lowest figures for each type of installation are considered. If, however, the highest figures of B. T. U. are taken the steam turbine requires only (25,000 — 17,850) × 100 ÷ 17,850 = 40 per cent more heat units. It will be conceded that these figures prove the statements made above that the modern steam turbine plants have much better than half the thermal efficiency of gas engine plants. It should be mentioned that no one of the plants cited has a very variable energy demand, as in the sense of roll train load. In the case of Heinitz and Louisenthal, which plants operate in parallel, it should be remembered that the coke oven gas engines of the Heinitz plant are run at a steady and almost full load, while the steam turbine plant Louisenthal handles all of the peak loads.

The above considerations outline to what great extent, in the decade past, the various types of electric roll motors and the generation of electrical energy for them have found application with the tremendous strides of the development of the steel business. The large heavy motor application and the generation of electric energy has thus become one of the most economical tools in the manufacturing of steel, and is playing a more important role than that of a by-product. While in its youth, the blast furnace gas engine was considered the most economical and appropriate type of prime mover in steel mills, the steam turbine of a certain type is gaining considerable ground with the growth of roll motor applications. The well founded reasons for the installment of steam turbines are as follows: Inherently good regulation and stability; great overload capacity with sustained high thermal efficiencies; reduction of costs of electric energy when dominating the service of gas engines, when in parellel with the same. As the matter stands today, the thermal efficiency of a first class European blast furnace gas engine (excluding generator) with scavenging and surcharging processes and utilization of the exhaust is approximately 30.4 per cent, but without these improvements it is about 26.9 per cent. The thermal efficiency of first class steam turbines operated with steam at 177.5 pounds per square inch pressure and 635 degrees Fahr. temperature is 23.3 per cent and approximately 24 per cent for very large units for a pressure of 192 pounds per square inch and a temperature of steam of 662 degrees Fahr. In this connection it might be well to quote the following paragraph from the famous book of Stodola: "The modern methods of regulation of turbines with over-load nozzles permit the imposing of high over-load, the steam turbines thus being (with respect to thermal efficiency) also equivalent to their rivals or even superior."

Specifications for Carbon Steel Rails

Inspection.

1.—Inspectors representing the purchaser shall have free entry to the works of the manufacturer at all times while the contract is being executed, and shall have all reasonable facilities afforded them by the manufacturer to satisfy them that the rails have been made and loaded in accordance with the terms of the specifications.

2.—All tests and inspections shall be made at the place of manufacture, prior to shipment and shall be so conducted as not to interfere unnecessarily with the operations of the mill.

Material.

3.—The material shall be steel made by the Bessemer or open hearth process, as provided by the contract.

Chemical Requirements.

4.—The chemical composition of each heat of the steel from which the rails are rolled, determined as prescribed in Section 6, shall be within the following limits:

BESSEMER STEEL

Elements considered.	Weights, lb. per yd. 50–69, incl.	70–84, incl.	85–100, incl.	101–120, incl.
Carbon, per cent	0.37–0.47	0.40–0.50	0.45–0.55	0.45–0.55
Manganese, per cent	0.80–1.10	0.80–1.10	0.80–1.10	0.80–1.10
Phosphorus, max., per cent	0.10	0.10	0.10	0.10
Silicon, max., per cent	0.20	0.20	0.20	0.20

OPEN-HEARTH STEEL.

Carbon, per cent	0.50–0.63	0.53–0.66	0.62–0.75	0.62–0.75
Manganese, per cent	0.60–0.90	0.60–0.90	0.60–0.90	0.60–0.90
Phosphorus, max., per cent	0.04	0.04	0.04	0.04
Silicon, max., per cent	0.20	0.20	0.20	0.20

5.—It is desired that the percentage of carbon in an entire order of rails shall average as high as the mean percentage between the upper and lower limits specified.

6.—In order to ascertain whether the chemical composition is in accordance with the requirements, analyses shall be furnished as follows:

(*a*) For the Bessemer process, the manufacturer shall furnish to the inspector, daily, carbon determinations for each heat before the rails are shipped, and two chemical analyses every 24 hours representing the average of the elements, carbon, manganese, silicon, phosphorus, and sulphur contained in the steel, one for each day and night turn respectively. These analyses shall be made on drillings taken from the ladle test ingot not less than ⅛ inch beneath the surface.

(*b*) For the open-hearth process the manufacturer shall furnish the inspector with a chemical analysis of the elements, carbon, manganese, silicon, phosphorus, and sulphur for each heat.

(*c*) On request of the inspector, the manufacturer shall furnish a portion of the test ingot for check analysis.

Physical Requirements.

7.—Tests shall be made to determine:

(*a*) Ductility or toughness as opposed to brittleness.

(*b*) Soundness.

8.—The physical qualities shall be determined by the drop test.

9.—The drop-testing machine shall be the standard of the American Railway Engineering Association.

(*a*) The tup shall weigh 2,000 pounds, and have a striking face with a radius of 5 inches.

(*b*) The anvil block shall weigh 20,000 pounds, and be supported on springs.

(*c*) The supports for the test pieces shall be a part of, or firmly secured to, the anvil. These supports shall be spaced 3 feet between centers for rails 100 pounds per yard or less in weight and 4 feet for rails over 100 pounds per yard in weight. The bearing surfaces of the supports shall have a radius of 5 inches.

10.—Drop tests shall be made on pieces of rail not less than 4 feet and not more than 6 feet long. These test pieces shall be cut from the top end of the top rail of the ingot, and marked on the base or head with gage marks 1 inch apart for 3 inches each side of the center of the test piece, for measuring the ductility of the metal.

11.—The temperature of the test pieces shall be between 60 and 100 degrees Fahr.

12.—The test piece shall ordinarily be

Adopted at the Atlantic City meeting of the American Society for Testing Materials and referred to the members for letter ballot.

placed head upwards on the supports, and be subjected to impact of the tup falling free from the following heights:

Weight of rail, lb. per yd.	Height of drop.
50- 60 inclusive	15 feet
61- 79 inclusive	16 feet
80- 90 inclusive	17 feet
91-100 inclusive	18 feet
101-120 inclusive	21 feet

13.—(*a*) Under impacts, the rail under one or more blows shall show at least 6 per cent elongation for 1 inch or 5 per cent each for two consecutive inches of the 6-inch scale, marked as described in Section 10.

(*b*) A sufficient number of blows shall be given to determine the complete elongation of the test piece of at least every fifth heat of Bessemer steel, and of one out of every three test pieces of a heat of open-hearth steel.

14.—It is desired that the permanent set after one blow under the drop test shall not exceed that in the following table, and a record shall be made of the information:

Section.	Weight, lb. per yd.	Moment of inertia.	Permanent Set, in. (measured by middle ordinate in a length of 3 ft.). Bessemer process.	Open-hearth process.
A.R.A.-A.	100	48.94	1.65	1.45
A.R.A.-B.	100	41.30	2.05	1.80
A.R.A.-A.	90	38.70	1.90	1.65
A.R.A.-B.	90	32.30	2.20	2.00
A.R.A.-A.	80	28.80	2.85	2.45
A.R.A.-B.	80	25.00	3.15	2.85
A.R.A.-A.	70	21.05	3.50	3.10
A.R.A.-B.	70	18.60	3.85	3.50

15.—Test pieces which do not break under the first or subsequent blows shall be nicked and broken, to determine whether the interior metal is sound. The words "interior defect" in the following sections shall be interpreted to mean seams, laminations, cavities, or interposed foreign matter made visible by the destruction test, saws or drills.

16.—One piece shall be tested from each heat of Bessemer steel.

(*a*) If a test piece does not break at the first blow and shows the required elongation (Section 13), all the rails of the heat shall be accepted, provided that the test piece when broken does not show interior defect.

(*b*) If, however, the test piece shows interior defect, the other test requirements having been met, all the top rails of the heat shall be accepted as special rails and further test shall be made on the second rails, as described in Paragraph (*d*) of this section.

(*c*) If the test piece breaks at the first blow or does not show the required elongation (Section 13), all the top rails of the heat shall be rejected.

(*d*) A second test shall then be made of the test piece selected by the inspector from the top end of any second rail or the bottom end of any top rails of the same heat, preferably the same ingot. If the test piece does not break at the first blow and shows the required elongation (Section 13), all the remainder of the rails of the heat shall be accepted, provided that the test piece when broken does not show interior defect.

(*e*) If, however, the test piece shows interior defect, the other test requirements having been met, all the second rails of the heat shall be accepted as special rails and further test shall be made on the third rails, as described in Paragraph (*g*) of this section.

(*f*) If the test piece breaks at the first blow or does not show the required elongation (Section 13), all the second rails of the heat shall be rejected.

(*g*) A third test shall then be made of the test piece selected by the inspector from the top end of any third rail or the bottom end of any second rail of the same heat, preferably the same ingot. If the test piece does not break at the first blow and shows the required elongation (Section 13), all the remainder of the rails of the heat shall be accepted, provided that the test piece when broken does not show interior defect.

(*h*) If, however, the test piece shows interior defect, the other test requirements having been met, all the remainder of the rails of the heat shall be accepted as special rails.

(*i*) If the test piece breaks at the first blow or does not show the required elongation (Section 13), all the remainder of the rails of the heat shall be rejected.

Open-Hearth Process Drop Test.

17.—Test pieces shall be selected from the second, middle and last full ingot of each open-hearth heat.

(*a*) If two of these test pieces do not break at the first blow and both show the required elongation (Section 13), all of the rails of the heat shall be accepted, provided that none of the three test pieces when broken shows interior defect.

(*b*) If, however, any one of the three test pieces shows interior defect, the other test requirements having been met, all the top rails of the heat shall be accepted as special rails and further test shall be made on the second rails, as described in Paragraph (*d*) of this section.

(*c*) If two of the test pieces break at the first blow or do not show the required elongation (Section 13), all the top rails of the heat shall be rejected.

(*d*) A second test shall then be made from three test pieces selected by the inspector from the top end of any second rails or the bottom end of any top rails of the same heat, preferably the same ingots. If two of the test pieces do not break at the first blow and both show the required elongation (Section 13), all the remainder of the rails of the heat shall be accepted, provided that none of the three test pieces when broken shows interior defect.

(*e*) If, however, any one of the three test pieces shows interior defect, the other test requirements having been met, all the top rails of the heat shall be accepted as special rails and further test shall be made on the second rails, as described in Paragraph (*g*) of this section.

(*f*) If two of the test pieces break at the first blow or do not show the required elongation (Section 13), all the second rails of the heat shall be rejected.

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(*h*) If, however, any one of the three test pieces shows interior defect, the other test requirements having been met, all the remainder of the rails of the heat shall be accepted as special rails.

(*i*) If two of the test pieces break at the first blow or do not show the required elongation (Section 13), all the remainder of the rails of the heat shall be rejected.

18.—No. 1 classification rails shall be free from injurious defects and flaws of all kinds.

19.—(*a*) Rails which by reason of surface imperfections, or for causes mentioned in Section 30 hereof, are not classed as No. 1 rails will be accepted as No. 2 rails; but No. 2 rails which contain imperfections in such number or of such character as will, in the judgment of the inspector, render them unfit for recognized No. 2 uses, will not be accepted for shipment.

(*b*) No. 2 rails to the extent of 5 per cent of the whole order will be received. All rails accepted as No. 2 rails shall have the ends painted white, and shall have two prick-punch marks on the side of the web near the heat number near the end of the rail, so placed as not to be covered by the splice bars.

20.—Rails accepted as special rails in accordance with Sections 16 and 17, shall have the ends painted blue and shall have three prick-punch marks on the side of the web near the heat number, so placed as not to be covered by the splice bars.

Details of Manufacture.

21.—The entire process of manufacture shall be in accordance with the best current state of the art.

22.—Bled ingots shall not be used.

23.—There shall be sheared from the end of the bloom, formed from the top of the ingot, sufficient metal to secure sound rails.

24.—The standard length of the rails shall be 33 feet, at a temperature of 60 degrees Fahr. Ten per cent of the entire order will be accepted in shorter lengths varying by 1 foot from 32 to 25 feet. A variation of ¼ inch from the specified lengths will be allowed, except that for 15 per cent of the order a variation of ⅜ inch from the specified lengths will be permitted. No. 1 rails less than 33 feet long shall have the ends painted green.

25.—The number of passes and speed of the train shall be so regulated that on leaving the rolls at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a rail 33 feet in length, and of 100-pound section, of 6¾ inches, and ⅛ inch less for each 10-pound decrease in section or ⅛ inch more for each 10-pound increase in section.

26.—The bars shall not be held for the purpose of reducing their temperature, nor shall any artificial means of cooling them be used after they leave the finishing pass. Rails, while on the cooling beds, shall be protected from snow and water.

27.—The section of rails shall conform as accurately as possible to the templet furnished by the railroad company. A variation in height of 1/64 inch less or 1/32 inch greater than the specified height, and 1/32 inch in width of flange, will be permitted; but no variation shall be allowed in the dimensions affecting the fit of the splice bars.

28.—The weight of the rails specified in the order shall be maintained as nearly as possible, after complying with Section 27. A variation of 0.5 per cent from the calculated weight of section, as applied to an entire order, will be allowed.

29.—Rails accepted will be paid for according to actual weights.

30.—(*a*) The hot-straightening shall be carefully done, so that gagging under the cold presses will be reduced to a minimum. Any rails coming to the straightening presses showing sharp kinks or greater camber than that indicated by the middle ordinate of 4 inches in 33 feet for A. R. A. type of sections, or 5 inches for A. S. C. E. type of sections, will be at once classed as No. 2 rails. The distance between the supports of rails in the straightening presses shall not be less than 42 inches. The supports shall have flat surfaces and be out of wind.

(*b*) Rails heard to snap or check while being straightened shall be at once rejected.

31.—Circular holes for joint bolts shall be drilled to conform to the drawing and dimensions furnished by the railroad company. A variation of 1/32 inch larger than the specified size of holes will be allowed.

32.—(*a*) All rails shall be smooth on the

heads, straight in line and surface, and without any twists, waves or kinks. They shall be sawed square at the ends, a variation of not more than $\frac{1}{32}$ inch being allowed, and burrs shall be carefully removed.

(*b*) Rails improperly drilled or straightened, or from which the burrs have not been removed, shall be rejected, but may be accepted after being properly finished.

(*c*) When any finished rail shows interior defect at either end, or in any drilled hole, the entire rail shall be rejected.

33.—(*a*) The name of the manufacturer, the weight and type of rail, and the month and year of manufacture, shall be rolled in raised letters and figures on the side of the web. The number of the heat and a letter indicating the portion of the ingot from which the rail was made, shall be plainly stamped on the web of each rail, where it will not be covered by the splice bars. The top rails shall be lettered "A," and the succeeding ones "B," "C," "D," etc., consecutively; but in case of a top discard of 20 or more per cent, the letter "A" will be omitted. All markings of rails shall be done so effectively that the marks may be read as long as the rails are in service.

(*b*) Open-hearth rails shall be branded or stamped "O. H." in addition to the other marks.

34.—All classes of rails shall be kept separate from each other.

Carbon Steel Bars for Railway Springs

1. — (*a*) These specifications cover three classes of bars, determined by their carbon ranges as specified in Section 3.

(*b*) The purposes for which these classes are frequently used, depending upon the design and upon the stresses and services to be imposed, are as follows:

Class A, for railway elliptical and helical springs.

Class B, for railway helical springs.

Manufacture.

2.—The steel shall be made by the open-hearth, crucible or electric process.

Chemical Properties and Tests.

3.—The steel shall conform to the following requirements as to chemical composition:

Elements considered.	Class. A.	B.
Carbon, per cent.....	0.90–1.10	0.95–1.15
Mang., max., per cent..	0.50	0.50
Phos., max., per cent...	0.05	0.05
Sulphur, max., per cent	0.05	0.05

4.—An analysis shall be made by the manufacturer from a test ingot taken during the pouring of each melt, a copy of which shall be given to the purchaser or his representative. This analysis shall conform to the requirements specified in Section 3.

5.—Analyses may be made by the purchaser from finished bars representing each melt, which shall conform to the requirements specified in Section 3.

Permissible Variations in Gage.

6.—The dimensions of the bars shall not vary from those ordered more than the amount shown in the following table:

FLATS.

Size.	Width, in. Over.	Under.	Thickness, in., Up to ½ in., incl. Over.	Under.	Over ½ to ⅝ in., incl. Over.	Under.
1 to 2 inches, inclusive.....	1/64	1/64	0.010	0.010	0.0156	0.0156
Over 2 to 6 inches, inclusive..	1/32	1/32	0.010	0.010	0.0156	0.0156

ROUNDS AND SQUARES

Size.	Diameter or thickness, in. Over.	Under.
⅜ to 1⅞ inches, inclusive.....	0.010	0.010

Finish.

7.—The finished bars shall be free from injurious defects and shall have a workmanlike finish.

Marking.

8.—The bars shall, when loaded for shipment, be properly separated and marked with the name or brand of the manufacturer and the melt number for identification.

Inspection and Rejection.

9.—The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the bars ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the bars are being furnished in accordance with these specifications. All tests (except check analyses) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

10.—(*a*) Unless otherwise specified, any rejection based on tests made in accordance with Section 5 shall be reported within five working days from the receipt of samples.

(*b*) Bars which show injurious defects subsequent to their acceptance at the manufacturer's works will be rejected, and the manufacturer shall be notified.

11.—Samples tested in accordance with Section 5, which represent rejected bars, shall be preserved for two weeks from the date of the test report. In case of dissatisfaction with the results of the tests, the manufacturer may make claim for a rehearing within that time.

Adopted at the Atlantic City meeting of the American Society for Testing Materials and referred to the members for letter ballot.

Small Gain

Made in Unfilled Tonnage by the Steel Corporation

The order book of the United States Steel Corporation, after having shown a steady decline in the amount of unfilled tonnage over three successive months, showed an increase of 34,697 tons on June 30. While this is a comparatively small increase, it reflects the slight improvement in bookings during June. This gain compares with a loss of 278,908 tons, which was reported on June 10, as of May 31. The total unfilled tonnage on June 30 amounted to 4,032,857 tons, compared with 3,998,160 tons on May 31. A statement of the unfilled tonnage of the Steel Corporation, showing the changes in tonnage and percentage by months, since the plan of announcing monthly the business on hand was adopted, follows:

Date.	Total.	Change, tonnage.	Change, per cent.
June 30, 1914....	4,032,857	34,697+	0.86+
May 31, 1914....	3,998,160	278,908—	6.98—
Apr. 30, 1914....	4,277,068	376,757—	8.09—
Mar. 31, 1914....	4,653,825	372,615—	7.42—
Feb. 28, 1914....	5,026,440	412,760+	8.95+
Jan. 31, 1914....	4,613,680	331,572+	7.74+
Dec. 31, 1913....	4,282,108	114,239—	2.59—
Nov. 30, 1913....	4,396,347	117,420—	2.60—
Oct. 31, 1913....	4,513,767	490,018—	9.79—
Sep. 30, 1913....	5,003,785	219,683—	4.24—
Aug. 31, 1913....	5,223,468	175,888—	3.03—
July 31, 1913....	5,399,356	407,965—	7.03—
June 30, 1913....	5,807,317	517,005—	8.18—
May 31, 1913....	6,324,322	654,440—	9.38—
Apr. 30, 1913....	6,978,762	490,194—	6.55—
Mar. 31, 1913....	7,468,956	187,758—	2.45—
Feb. 28, 1913....	7,656,714	170,654—	2.18—
Jan. 31, 1913....	7,827,368	104,796—	1.32—
Dec. 31, 1912....	7,932,164	79,281+	1.01+
Nov. 30, 1912....	7,852,883	258,502+	3.40+
Oct. 31, 1912....	7,594,381	1,042,874+	15.33+
Sep. 30, 1912....	6,551,507	388,132+	6.29+
Aug. 31, 1912....	6,163,375	206,296+	3.46+
July 31, 1912....	5,957,079	149,773+	2.58+
June 30, 1912....	5,807,346	56,363+	0.98+
May 31, 1912....	5,750,983	86,983+	1.52+
Apr. 30, 1912....	5,664,885	360,044+	6.97+
Mar. 31, 1912....	5,304,841	149,359—	2.79—
Feb. 29, 1912....	5,454,200	74,479+	1.38+
Jan. 31, 1912....	5,379,721	294,960+	5.71+
Dec. 31, 1911....	5,084,761	942,806+	23.24+
Nov. 30, 1911....	4,141,955	447,627+	12.06+
Oct. 31, 1911....	3,694,328	83,011+	2.25+
Sep. 30, 1911....	3,611,317	84,668—	2.34—
Aug. 31, 1911....	3,695,985	111,900+	3.33+
July 31, 1911....	3,584,085	223,027+	7.16+
June 30, 1911....	3,361,058	247,871+	7.96+
May 31, 1911....	3,113,187	105,617—	3.28—
Apr. 30, 1911....	3,218,704	228,597—	6.63—
Mar. 31, 1911....	3,447,301	46,758+	1.37+
Feb. 28, 1911....	3,400,543	289,624+	9.31+
Jan. 31, 1911....	3,110,919	436,163+	16.30+
Dec. 31, 1910....	2,674,757	85,656—	3.09—
Nov. 30, 1910....	2,760,413	111,536—	3.88—
Oct. 31, 1910....	2,871,949	286,157—	9.12—
Sep. 30, 1910....	3,159,106	379,088—	10.74—
Aug. 31, 1910....	3,537,128	433,803—	10.92—
July 31, 1910....	3,910,931	286,863—	6.72—

Bankrupt Sale.—Jas. P. Hill, trustee in bankruptcy of the Pierce, Butler & Pierce Mfg. Co., has scheduled for Thursday, July 23, a public auction sale for the disposal of all property of the bankrupt concern. This property includes three tracts of real estate and plants in the town of Dewitt, Onondaga county, N. Y. The sale will include the plants and real estate of the bankrupt company; also its boiler and radiator patterns and fallow boards, boiler flasks and radiator flasks, machinery, boilers, dynamos, engines and other equipment.

The Maxwell plant, at Tarrytown, N. Y., of the old United States Motors Co., has been purchased at auction by W. C. Durant.

Gigantic Task of Valuation

Of Physical Properties of the Railroads Has Been Inaugurated by the Interstate Commerce Commission

Washington, July 14. — Editorial comment recently by THE IRON TRADE REVIEW on the commencement address at Worcester Polytechnic Institute by Prof. Mortimer E. Cooley, dean of the department of engineering of the University of Michigan, as to the important part to be played by engineers in the tremendous task involved in the physical valuation of the railroads, brings to mind the fact that really comprehensive idea of this task, so well understood by the professor and engineers, is probably little realized by the public at large. The object of the work, it may be set out at the beginning, is to obtain data to determine whether a given scale of rates is reasonable. The information must be accurate and be verified under oath and stand the acid test in court.

The sundry civil bill, to be passed in a short time, will carry an allowance of $1,750,000 for the ordinary work of the Interstate Commerce Commission and $1,900,000 for the physical valuation of the railroads of the entire country, to be under the supervision of the commission. So quietly has Charles Azro Prouty, himself a former member of the commission, proceeded in the organization of that gigantic undertaking that only those directly concerned appreciate the fact that for the next six or eight years it will be the most responsible occupation of the commission, by far the greatest job it has ever faced. To the railroads and shippers over all the land the outcome of this work is a momentous matter.

At present there are 400 men employed in the work. More would be on the list if the Civil Service Commission were able to find the men it deems fitted for the work—and the pay were greater. The requirements upon the young men who go ahead of surveys with rod and chain and perform other tasks of that character are held to be too great. With Congress loosening its purse strings, however, this matter will become a minor one and be eleminated from consideration.

Work of Surveyors

Surveyors are already at work on the Norfolk & Southern, the Atlanta, Birmingham & Atlantic, the Texas Midland, the San Pedro, the Los Angeles & Salt Lake, the Great Northern, the Central of Georgia, the Chicago & Eastern Illinois, the Elgin, Joliet & Eastern and the Kansas City Southern. Within a month surveying parties will be at work on the Pere Marquette, the Western Pacific and the Boston & Maine.

In addition to the surveyors, expert accountants are in the central offices of the railroads mentioned and others are busy elsewhere obtaining the history of the roads. The "historians" will produce receipted bills and other railroad paper involving business matters to show costs of operations, equipment and so on, and will check up with figures obtained by those surveying the roads. Accuracy is the keynote of the situation—that must be secured and every possible resort known to the expert accountant, the surveyor and others in the work will be employed to bring this about. Without it, the work will all be for nothing.

The Norfolk & Southern, for example, with a line of a little more than 100 miles, is the work of 29 different corporations. The Boston & Maine, subsidiary in fact, if not in name, of the New Haven, is composed of 167 corporations, one of them, it may be stated for purposes of illustration, being the Woodbridge Aqueduct Co. Who knows what part that corporation played in making up what is known as the Boston & Maine? These great complexities have to be worked out. Conceived for different reasons, they will now have to be revealed. It must be observed, of course, that some of these reasons were perfectly legitimate.

How Work is Divided

The valuation work is divided into four parts: Engineering, with a board constituted of an engineer in charge of each of the five districts into which the country is divided; accounting, for which there is a similar board; land and law. Patrick J. Farrell, former solicitor for the Interstate Commerce Commission, will take upon himself the responsibility of defending the orders of the commission in connection with the work. It may be safely predicted that any amount of litigation will be involved in connection with this work.

Adverting to the surveyors, an idea of their difficult task is partly comprehended when it is known that they will measure every inch of a railroad, its culverts, bridges and buildings. They will set down the number of units of excavation, the number of ties and rails, the miles of wooden fence, of wire fence; in fact, everything that can be measured or counted. Accountants will go over the books to get the cost price of each unit and everything of that kind that will aid in learning the number of dollars actually paid out. The men in the land department appraise the real estate holdings, and the two men in the law department will advise as to what can and what cannot be done under the law authorizing this valuation.

Every railroad is to be appraised. Its appraisal is to be called the tentative valuation and it stands until the figures are to be used in court. The railroad company, naturally, is given an opportunity to check up the government work and see to it that it gets credit for all its property.

Applying the Valuation

Then follows the pivotal object. The commission will undertake to apply the valuation as a test of the reasonableness of rates. Everything must be proved up as in any other cause and brought down to the minute of time when the rates are asserted to have become unreasonable. It is aimed to be a practical and highly scientific way of creating a correct rate structure. It will indeed be a revolution in rate making. The claim time and time again has been made by railroads when in court that the property devoted by them to the service of the public is worth more than the capitalization. Having been without the instruments to check up these assertions, the commission has been helpless as regards them.

The matter of ascertaining the value, it is obvious, is a big question. Unearned increment, reproduction, reproduction minus depreciation and innumerable other things to engage political and other economists, as well as land law philosophers, all take a part in this complex game.

Just now the inquiry pertains to the original cost, without regard to the value of the land, or whether a railroad company is entitled to list the land given to it as an asset upon which it is entitled to a reasonable

return in excess of its value assessed for taxation purposes; or whether it is even entitled to that much.

These are some of the intricacies involved in the physical valuation of the railroads.

Virginia Rates

On Pig Iron Revised by Interstate Commerce Commission

Washington, July 14.—Coming two days after the finding in the Sloss-Sheffield case, the Interstate Commerce Commission last Thursday handed down an opinion holding that rates on pig iron from furnaces in Virginia to New England and middle Atlantic states are unreasonable and unduly discriminatory as compared with rates quoted to producers at competing points in Pennsylvania and New York.

By the decision new rates, to become effective Aug. 15, when new rates in the Sloss-Sheffield case also become operative, will be as follows:

To Baltimore, $2.25 per gross ton, reduced from $2.45; to Philadelphia, $2.75, cut from $3; to New York, $3, reduced from $3.95, and to Boston, $3.50, reduced from $3.75. The reductions range from 8 to 24 per cent, the New York cut being the greatest. The complainants had expressed the hope that decreases of from 20 to 50 per cent would be made. No order was entered but one will be unless the suggested rates are put into effect.

The Virginia furnaces all have the same rate. The complainants were the Low Moor Iron Co., Low Moor and Covington; the Allegheny Ore & Iron Co., Iron Gate and Buena Vista; the Oriskany Ore & Iron Corporation, Reusens; the Princess Furnace Co., Glen Wilton; the Virginia Iron, Coal & Coke Co., Roanoke, Radford and Pulaski, and the Pulaski Iron Co., Pulaski.

Suggestions as to what amount the reductions should be, as made by the complainants, were based on the fact that rates from Virginia furnaces to such points as Baltimore, Philadelphia and New York are from 20 to 50 per cent higher than the rates from other representative furnaces, such as those of Birmingham, Ala., east of the Mississippi river to points ranging from 250 to 750 miles distant and also that the ton-mile rates from Virginia points to such destinations as Cincinnati, Chicago and St. Louis are much lower than the ton-mile rates from Virginia furnaces.

Through the readjustment of rates to be made that to New York, now greater than to New England, though the distance is materially less, will become less than the Boston rate.

The decision, prepared by Commissioner Daniels, upholds the contention of the complainants that the northern rail lines were receiving unreasonable divisions of the rates. Figures were submitted in the decision to show the two southern lines involved, the Chesapeake & Ohio and the Norfolk & Western, which carry the iron to the two gateways to the north, Potomac Yard, Va., and Hagerstown, Md., have been receiving materially less than their proportionate division of the rates.

Low Moor was taken as typical of the Virginia furnaces, while Baltimore, Philadelphia, New York, Stamford, Conn., and Boston were considered fairly representative of points of destination. Tables were also produced to show that the rates from Virginia furnaces are considerably higher, mile for mile, than the rates from northern competing points, including Pittsburgh, Emporium, Saxton and Punxsutawney, Pa., Youngstown, O., and Buffalo.

"The evidence shows, says, the opinion, "that in recent years the southern furnaces have suffered severely in New England and at other points in the middle states from this competition (rates on northern railroads), and it is insisted that in the near future the southern furnaces will be entirely driven out of business in this territory unless a fair adjustment of freight rates can be secured."

The several contentions of the northern roads made to support existing rates are answered and the commission says it is not favorably impressed with the argument that the shrinkage of the rates from Virginia furnaces to the level of rates enjoyed by their Pennsylvania and New York competitors would provoke the latter in turn to insist upon a further depression in the rates on Pennsylvania and New York iron.

"The question at issue," continues the opinion, "is, Do the present rates work relative injustice to the Virginia furnaces? If they do, and we so hold, the allegation that when the remedy is applied, the northern competitors will again insist upon being accorded a new preferential advantage, amounts to saying that the northern furnaces and their carrier allies contend for a permanent coign of unjust advantage for the furnaces of one region."

The works of the American Shear & Knife Co., Hotchkissville, Conn., was damaged by fire recently.

Findings

Of a Thorough Investigation of the Automobile Industry

An exhaustive investigation of the automobile industry has been made by the Curtis Publishing Co., Philadelphia, which assigned Charles Coolidge Parlin, a trained expert, to the work. Mr. Parlin and his staff have worked for many months delving into the automobile industry, traveled about 43,000 miles, and collected over 800 personal interviews on which to base their statements and conclusions. The territory covered extended from the Atlantic to the Pacific, and from the southern to the northern states.

Among the findings of the investigations were these:

The automobile industry is permanent.

It will never be a monopoly.

Total number of machines sold each year still on the increase.

Market for cars costing between $950 and $1,500 still increasing.

Chief problem for new company in $1,000 field is merchandising.

Problem for new company in field below $1,000 is production.

There is a good field for a $750 car.

Starvation of the weak is at hand.

Advertising value of racing is dead.

Long-distance touring is on the decline; sight-seeing touring probably on increase.

The industry has been built on advertising.

During 1913 approximately $3,426,991 was spent in 26 publications for national advertising.

Too many chassis made in the early days.

Highest success is in concentration on one grade.

Seasonal production and other reasons complicate labor problem.

Future automobile may be different in style, but will accomplish little more practically.

Greatest demand is for improvement in tires and for carburetor for low grade fuel.

Most vexatious problem is disposal of second hand cars.

Farmer will provide one of large future gains in sales.

Women influence from 50 to 95 per cent of sales.

Detroit manufactured in 1913 68 per cent of all gasoline pleasure cars made in United States.

Nearly one-half of all cars sold in 1913 were Fords.

Credit is on the increase.

Southern California has largest distribution per capita.

Important

Changes Made — Specifications for Certain Steels

Important changes made by the Association of American Steel Manufacturers on April 21, 1914, and embodied in new specifications for structural and boiler steel, concrete reinforcement bars rolled from billets and rail steel concrete reinforcement bars are noted in the copies being distributed under the direction of Frank A. Robbins Jr., secretary and treasurer of the association, Steelton, Pa. The changes in the specifications have been made upon the basis of a large amount of work and the collection of important data.

The principal changes in the structural and boiler steel specifications have to do with narrowing the tensile range for firebox steel. Up to this time, the tensile strength required for this grade of steel was 52,000 to 62,000 pounds per square inch; now it has been narrowed to 52,000 to 60,000 pounds. New tables are published covering the permissible variations in gage and weight of sheared plates, the new tables replacing those adopted by the association in 1896 which since have been copied widely into nearly all plate specifications. The new tables refer to individual plates rather than averages, and the subdivision as to width is carried out in much more detail than in the old tables.

In the specifications for concrete reinforcement bars rolled from billets, an intermediate grade of bars with tensile strength of 70,000 to 85,000 pounds has been introduced between the "structural steel grade" and the "hard grade". In the rail steel reinforcement specification, paragraph 5 (a) reads as follows respecting tests:

"One tensile and one bending test shall be made from each lot of ten tons or less of each size of bar rolled from rails varying not more than ten pounds per yard in nominal weight. Should a test specimen develop flaws, or should the tensile test specimen break outside of the middle third of its gaged length it may be discarded and another test specimen substituted therefore. In case a tensile specimen does not meet the specifications, an additional test may be made".

Cuyuna Iron Range Notes

Brainerd, Minn., July 14.—The Iroquois property at Crosby will ship this season 250,000 tons and the Rogers, Brown Ore Co. 200,000 tons, making a total of 450,000 tons. The Rowe mine, the first pit mine of the range to ship this season, may ship 300,000 tons. The mine is loading daily 80 cars.

Eastern directors of the American Manganese Mfg. Co. are expected on the range this week to inspect the Cuyuna-Mille Lacs and the Cuyuna-Duluth mines to arrange for heavy shipments. The Interstate Mining Co. is check drilling the property of the Cuyuna Iron & Manganese Ore Co. and finding good ore.

The Wilcox mine of the Canadian-Cuyuna Ore Co. at Woodrow at ledge encountered a boil of water which filled the shaft up 50 feet. Work is now being carried on clearing the shaft.

The Longyear Exploration Co. is on its fourth hole drilling the county poor farm of Crow Wing county. The Brainerd-Cuyuna mine in the city limits of Brainerd has both its No. 1 and No. 2 shafts nearing ledge.

The Duluth-Brainerd mine north of Ironton and near Iron Mountain will be in ore in a few days. At the Barrows mine, Supt. W. J. Nicholas may be transferred to the Crystal Falls, Mich., district.

Improvements

To be Made by Tennessee Company—Alabama News

Birmingham, Ala., July 14.—President George Gordon Crawford of the Tennessee Coal, Iron & Railroad Co. has announced improvements at the various operations of the company involving an approximated expenditure of $85,000. Improvements at the Bessemer, Ala., rolling mills costing about $55,000 are included.

The Superior Pipe plant, a new concern at Bessemer, Ala., under the course of construction for the past several months, will begin operations, July 15. W. L. Martin is president, J. D. Shook is secretary-treasurer and Mr. Birdwell is manager. The various buildings of the plant are arranged to connect with each other and all are fire proof. The plant is situated close to four railroads. Pipe from two to six inches will be manufactured, with fittings.

Orders have been issued by the Gulf States Steel Co. to fire all of the company's 300 coke ovens at Virginia mines. The ovens have been cold for several months.

Great Falls Power Co., Volta, Mont., has let contract to the Riter-Conley Mfg. Co., Pittsburgh, for six main penstocks, 12 feet 6 inches in diameter and 280 feet long; two exciter penstocks, 5 feet by 280 feet each, and other miscellaneous air and access pipes, requiring approximately 1,500 tons.

Trenton Plant

Of American Bridge Co. is Busy in Heavy Tonnages

Trenton, N. J., July 13.—The local plant of the American Bridge Co. is very busy at the present time and many orders are awaiting to be filled. One of the company's contracts is for 27,000 tons of steel for the Lexington avenue subway, New York, and the elevated road with which it will connect in the upper part of the city. For the subway great girders to support the street are being made here, and for the elevated road both girders and the upright columns are being fabricated and shipped. The company has been working on these contracts nearly a year with the mills running full time.

Another important contract upon which the company is now busy is one for all the columns of the 20-story building that Post & McCord are constructing on Fifth avenue, New York. This calls for 5,000 tons of steel.

It was at this plant of the American Bridge Co. that all of the 800 steel towers and bridges for carrying power from one end of the Panama canal to the other were manufactured, and not long ago the company completed a large contract for the Postal Telegraph Co. in the Republic of Argentina, South America. The local plant has been here 14 years, employs many men, pays high wages and has no labor troubles.

Motor Car Plant Sold

The plant of the Columbia Motor Car Co., of Hartford, Conn., has been sold to the Billings & Spencer Co., manufacturer of machinists' tools, drop forgings and forge machinery, which will utilize the property for its line of manufacture. The sale covers 10 acres of land and numerous brick buildings. The original plant was erected in 1894, by the Pope Mfg. Co., for the manufacture of seamless tubes for bicycle frames. Subsequently, it was devoted to the production of motor vehicles and finally passed into the hands of the Maxwell interests and the United States Motor Co. The latter, which has been liquidating some of its assets, put the property on the market some time ago.

Meeting Postponed. — As many members of the Western Scrap Iron and Steel Association are now away on their vacations, it has been decided to postpone the next general meeting from July 21 to Tuesday, Aug. 18, at the Hotel La Salle, Chicago.

TIPS FOR NEW BUSINESS

Equipment needs of the Iron and Steel works, Machine shops, Foundries and other Metal Working plants

In New York the volume of machinery sales fell off somewhat last week, as compared with the week preceding, but the market continues to reflect the improvement in tone which began to be manifested two or three weeks ago. A good many fair-sized sales were reported last week to buyers all through the metropolitan district. Inquiries of importance have fallen off somewhat and there have been no developments in the field for railroad equipment with the exception of an inquiry for about six tools put out by the Lehigh Valley railroad. There continues a good demand for second-hand machinery, but the volume of demand from abroad again has fallen off.

In Cincinnati, the machinery market remains at a standstill. Only one large machine tool maker in this city is busy, while others are running along on part schedule. A number of shops have closed down for the summer months, some for alterations and repairs, but the majority because of lack of orders. The month of July this far has shown a slight decrease in comparison with June, and the latter month was below either April or May in the volume of business done. Makers of laundry machinery are busy, mostly on old orders. Second-hand machinery is quiet and unsatisfactory. Small electrical equipment is fair, but makers of this line are not running full.

EASTERN STATES

CAMBRIDGE, MASS. — Babcock-Davis Corporation has been incorporated; machinery; $75,000; by W. A. Davis and L. H. Babcock, Cambridge.

SALEM, MASS.—The Salem Electric Light Co. will re-equip its power plant, making it one of the largest in New England.

SALEM, MASS.—Geo. C. Vaughan has applied for a permit to erect two factories on Bridge street near Boston street; one to be three stories, 42 x 250 feet; the other to be two stories, 50 x 150 feet.

BRIDGEPORT, CONN.—The United Metal Works, Inc., has been incorporated; metal goods, etc.; $5,000; by Herman Abrams, Alfred E. Woolard, A. T. Woolard, C. H. Woolard and M. J. Hatfield, city.

BRIDGEPORT, CONN.—The Bullard Machine Tool Co. has increased its capital stock from $500,000 to $1,000,000 by creating additional preferred stock; E. P. Bullard Jr., D. B. Bullard, S. H. Bullard and A. H. Bullard, directors.

CHESTER, CONN.—C. J. Bates & Son will make additions to their cutlery manufacturing plant as follows: One 1-story and one 2-story brick buildings, 25 x 25 feet and 30 x 70 feet respectively.

DERBY, CONN. — The Birmingham Iron Foundry is adding to one of its machine shops, an extension 90 x 160 feet. H. F. Wanning, president of the company, advises that the extension is not being made because of good business, as, unfortunately, the business outlook is far from satisfactory. The company simply is taking advantage of the dullness and the low prices on materials to build the extension which it hopes to use to advantage at some future time.

TORRINGTON, CONN.—The Union Hardware Co. will erect a 1-story, 22 x 71-foot brick factory here; Frank W. Fuller, contractor.

BUFFALO.—Contract for building an addition to the King Sewing Machine Co. has been awarded to the Riverside Bridge Co., Wheeling, W. Va.

BUFFALO.—The Fratt & Letchworth Co., with a plant at Black Rock, will erect a $20,000 annealing plant addition at 179 Tonawanda street.

HARRISBURG, PA.—The Middletown Car Co. will spend $500,000 for a new building and other improvements; site covers two entire blocks.

PHILADELPHIA.—H. T. Paiste Co. has increased its capital stock from $100,000 to $150,000; the firm manufactures electrical specialties.

WASHINGTON, PA.—The H. L. Dickson Co. has begun work which will result in doubling the capacity of the Duncan-Miller glass plant.

YORK, PA.—Hench & Dromgold Co. has purchased land on Elmwood and will erect a large and modern machine plant for manufacturing agricultural implements.

BAYONNE, N. J.—The Bayonne Bolt & Nut Co. is erecting a large extension to its plant. This has been completed with the exception of the roof and the plant is expected to be in operation by early fall.

PERTH AMBOY, N. J.—County freeholders will take bids until July 20 for steel and concrete bridge at Combery Place.

PLAINFIELD, N. J.—Henry Capes Brass Foundry Co. has been incorporated to manufacture brass, bronze and copper products.

PRINCETON, N. J. — The trustees of Princeton University will erect a dormitory to cost $200,000. The work will be started next fall. The architects are Klauder & Day, of New York.

TRENTON, N. J.—Contractor Edward H. Stout has received the contract for the erection of a nurses' home at the City Hospital, to cost $7,270.

TRENTON, N. J.—The American Steel & Wire Co. is building a three-story brick addition to its plant here. The contractor is F. W. Van Loon and the cost will be $75,000.

CENTRAL STATES

CINCINNATI.—The C. & O. railroad has agreed to erect a concrete and steel viaduct over the tracks on the Ferguson road near Covedale.

CLEVELAND. — The Stove Improvement Co. has been incorporated to manufacture stoves, heaters and ranges; $10,000; by E. V. Coulston, E. A. Strucker, Lloyd Walker, F. C. Creder and W. B. Burch.

CLEVELAND.—The Otis Elevator Co. proposes to erect a 4-story brick, steel and concrete service and office building on East Sixth street between the Goodrich house and Therese court.

CLEVELAND.—Bids will be received at 513 the City Hall until noon July 17 for the following: Power house for city hospital group; lead covered cable and weatherproof copper wire for municipal electric light plant; proposals must be entered on blanks obtainable at the city hall. Bids will be received same place until noon July 16 for pig lead for the department of public utilities.

CUYAHOGA FALLS, O.—The Falls Hollow Staybolt Co. is making arrangements to build a plant. New departments will be added.

LIMA, O.—The Pine street bridge to be erected here will be 180 feet long, 42 feet wide, three spans, of concrete with place for sidewalks and street car tracks; cost, $30,000.

MANSFIELD, O.—City will receive bids for the proposed lighting system until Aug. 1; plans by H. Whitford Jones, consulting engineer, Cleveland.

MASSILLON, O.—Pennsylvania railroad has obtained a franchise to lay additional tracks across several city streets. W. H. Davey, general manager of the Massillon Rolling Mill Co., says that as soon as the Pennsylvania railroad gets the franchise to extend a track to the mills, work will be started on the plant it is erecting for the American Stamping & Enameling Co.

SALEM, O.—The Pittsburgh Foundry, Wilson street, will extend the north end of its shop 50 feet; work to start at once.

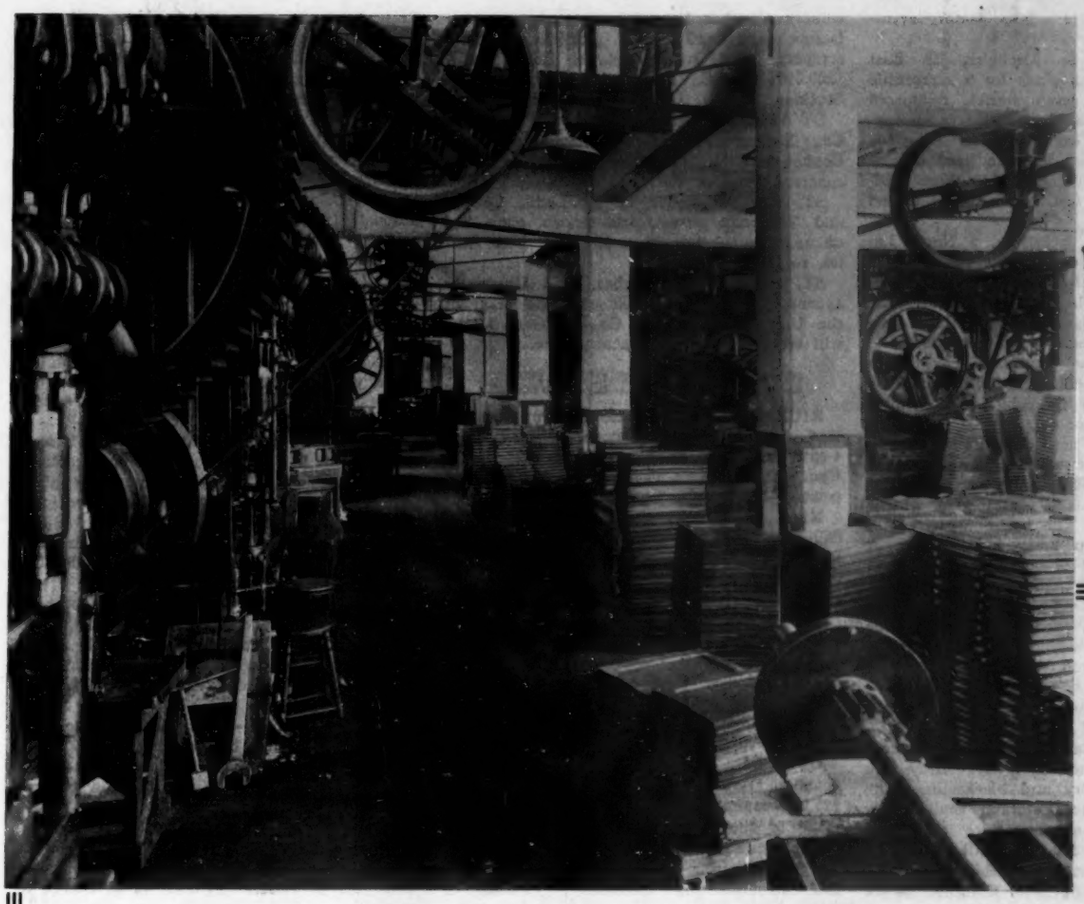
TOLEDO, O. — The Schmidt-Harwood Co. has recently awarded contract of J. B. Breyman for the construction of a new factory building at 1025 Front street at a cost of $28,000. Brick and concrete will be used in the construction. The factory building will be occupied by the Peerless Bedding Co., and the McCreery Mfg. Co., both Toledo concerns.

YOUNGSTOWN, O.—The Canton, Akron & Youngstown line will be extended from its present terminal in Mogadora, to Canton and a belt line will be constructed around that city; estimated cost, $3,000,000.

COVINGTON, KY.—United States Motor Truck Co. has been incorporated; $250,000; by R. C. Stewart, B. Bramlage and M. H. McLean.

GARY, IND.—Horton & Williams Electric Co. has been incorporated to manufacture and install electrical apparatus; $10,000; by Geo. W. Horton, city; and H. B. Williams and N. H. Williams.

VINCENNES, IND.—The Vincennes Knotter Co. has purchased the patent rights and plans to manufacture baling presses; the company is incorporated with $100,000 capital by Charles Unger, Henry M. Williams, et al.; at present it will lease the plant of Williams



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General Office: Railway Exchange, Chicago

801 Swetland Building, Cleveland, Ohio. 1117 Rialto Building, Kansas City, Mo. 1402 Exchange Building, Memphis, Tenn. 554 Pierce Building, St. Louis, Mo. 319 Perry Building, Philadelphia, Pa.

& White, but will build a large factory eventually.

CHICAGO. — A. S. Alschuler, 28 East Jackson boulevard, has plans for a mercantile building, 70 x 170, seven stories, reinforced concrete, to cost $130,000.

CHICAGO.—The Geo. A. Fuller Co., 140 South Dearborn street, has the general contract for an office building at 131 West Madison street, 66 x 136 feet, 16 stories, steel and brick.

CHICAGO.—C. A. Eckstrom, 5 North LaSalle street, is completing plans for an auto service building for the Willys Overland Motor Co. at 2426 South Michigan avenue. The structure is to be 106 x 300 feet, three stories, of reinforced concrete, to cost $300,000.

DETROIT.—Various contracts have been let for the foundry building to be erected by the Fairview Foundry Co. which is controlled by the Chalmers Motor Co.

ANTIGO, WIS.—The Lyons Boiler Works, DePere, Wis., were awarded the contract for installing a new 350-horsepower boiler and a 90 x 6-foot steel stack in the plant of the Antigo Electric Co. The boiler capacity will thus be increased to 1,000 horsepower. A 30 x 50-foot addition is being constructed to accommodate the new equipment.

ELKHORN, WIS.—The contract for all steel and iron work, including cells, for the new $35,000 Walworth county jail was awarded to the Stewart Iron Works, Cincinnati, at $8,728.

KENOSHA, WIS. — The additions costing $100,000 just started by the Simmons Mfg. Co., of Kenosha, metal beds, springs, etc., consist of three large buildings, viz.: Gray iron foundry, brass foundry and blacksmith shop, 60 x 200 feet; pattern storage vault, 40 x 125 feet; machine shop, pattern shop and drafting room, 60 x 260 feet. All will be of steel and brick construction, the erector being the Kenwood Bridge Co., Chicago. Work is to be completed Aug. 31.

MILWAUKEE, WIS.—Lamb & Co., architects, New York City, have been commissioned by the Saxe Bros. Amusement Co., Milwaukee, to prepare plans and superintend the construction of a $650,000 theater and office building on Third street, north of Grand avenue, Milwaukee. It will be of steel and enameled tile construction, and the theater will seat 3,500. Work will begin about Sept. 15.

RACINE, WIS. — The Universal Crushed Stone Co., Racine and Ives, Wis., has increased its capital stock from $130,000 to $215,000 and plans to install additional electrical hoisting, tramway and crushing equipment.

SUPERIOR, WIS.—The contract for structural steel and iron for the $75,000 Superior Y. M. C. A. building has been awarded to the Worden-Allen Co., Milwaukee. Frank Hayes is chairman of the building committee.

WEST BEND, WIS. — The West Bend Heating & Lighting Co., formerly the West Bend Milling Co., has awarded the general contract for the reconstruction and re-equipment of the plant, badly damaged by fire several months ago, to the General Construction Co., of Chicago. The mill will be rebuilt as a light, power and central heating plant.

KANSAS CITY, MO.—The Rock Island railroad will build a plant and storage bins adjoining its elevator in the Armourdale district; 1,000,000 bushels capacity, steel and concrete construction; cost, $200,000.

SLATER, MO.—Engineers G. E. Hines, E. W. Bacharach and C. W. Lusk, of Kansas City, have been making surveys and are now drawing up blueprints for the settling basins, pumping station and pipe line to the river. The railroads and State Utility commission have yet to pass on the plans.

MINNEAPOLIS. — Stockland Road Machinery Co. has been incorporated to manufacture and sell road graders, ditchers, scrapers, road rollers, plows, drags, etc.; $200,000; by C. K. Stockland, George A. Stockland, A. G. Dunlop and Henry Doerr.

OWATONNA, MINN.—The Dix Machine Co., Stillwater, Minn., manufacturer of the Gopher Traction Ditches, will erect a large concrete building here.

ST. PAUL.—Walter C. MacLeith, College and Waubesha street, has drawn plans for an apartment house 82 x 154 feet, nine stories, to cost $260,000.

ST. PAUL.—L. C. Erbes, 2654 University avenue, who recently took over the plant of the United States Mfg. Co., Jackson, Mich., will erect a large auto factory here.

SOUTHERN STATES

RICHMOND, VA.—State highway commission will take bids until noon, July 26, for a 4-span reinforced concrete bridge over Broad Run, six miles from Paeonia Springs, Loudoun county; $250 check required.

NEW ORLEANS.—Louisiana Nut & Machine Co. has been incorporated; $100,000; by Sam Blum, president; Joseph E. Friend, vice president; Joseph Samuel, secretary-treasurer; it will manufacture nut crackers, etc.

SAN ANTONIO, TEX.—San Antonio Water Supply Co. will receive bids until Aug. 3 for furnishing two 5,000,000-gallon pump and steam turbines, condensors and accessories, three 250-horsepower boilers and accessories, etc. Information may be obtained from Robert J. Harding, chief engineer.

BRISTOL, TENN.—Bristol Machine & Locomotive Works has been organized with $25,000 capital stock. It has taken over the plant of the Bristol Machine Works, which it will enlarge and remodel; principal work will be repairing and rebuilding locomotives and manufacturing machinery; Charles H. Rhodes, general manager.

DUCKTOWN, TENN. — The Tennessee Copper Co., of New York, has awarded contracts for additional construction and machinery at its Burra and McPherson improvements at Ducktown. The company will erect a breaker and power plant at the McPherson mine, the foundations to be of concrete and the superstructure of steel. This plant will have a daily capacity of 1,000 tons of ore. The Burra improvements will be undertaken after the completion of the McPherson work. The total cost involved in the improvements is to be about $1,000,000.

KNOXVILLE, TENN.—The East Tennessee Coal Co. is in the market for electrical equipment for its mine at Hazard; W. E. Davis, Hazard, will make the purchases.

MORRISTOWN, TENN.—The Hardwood Top & Panel Co. has leased a building which it will equip for manufacturing glued-up material for furniture manufacturers; power and woodworking machines will be needed; H. S. Taylor is manager.

NASHVILLE, TENN.—The Killman Hydraulic Power Transmission Co. is being organized here by Thomas A. Killman, et al.; it will make a patent valveless hydraulic pump.

WESTERN STATES

ANN-CARR, NEB. — Niobrara Electric Light, Power & Railway Co. has been incorporated to do a general light and power business and operate a railroad; $300,000; by Hugh O'Neill, president; Carl W. Grant, secretary.

KANSAS CITY, KAS.—Wyandotte county commissioners at office of Frank Holcomb, county clerk, will receive bids until 10 a. m., July 27, for the proposed East Kansas avenue bridge, to cost $450,000; Hedrick & Cochrane, Kansas City, Mo., engineers.

GREAT FALLS, MONT. — United States Reclamation Service will take bids until 2 p. m., Aug. 4, for furnishing structural steel cast iron sluice and regulator gates, gate frames, gate stands and accessories for projects in northern division.

HELENA, MONT.—Contract has been let for the first 20-stamp unit to be erected in the mill on Porphyry Dyke mine to Taylor Engineering & Mfg. Co., Allentown, Pa., and Denver, Colo. It is planned to install 40 additional stamps after the first unit starts operating; James Breen, owner, Broadwater hotel, Helena.

BOVILLE, IDA.—The question of a $20,000 bond issue will be submitted for a water system; plans include a steam pump, power house steel mains and 14 fire hydrants.

MOSCOW, IDA.—The Oregon-Washington Railway & Navigation Co. plans extending the Colfax-Moscow branch for 26 miles to connect with the Milwaukee road at Boville.

SPOKANE, WASH.—Commissioner Fassett will submit a proposition for an auxiliary water station at the up-river pumping plant with pumps to be driven by water power; estimated cost, $100,000.

ASTORIA, ORE.—Council has granted a franchise to the Pacific Power & Light Co. for proposed extensions.

ASTORIA, ORE.—The contract for the construction of five steel bridges has been awarded by the county to Portland Bridge Co., of Portland, at $18,500. Plans were prepared under direction of H. L. Bowlby, state highway engineer.

DALLAS, ORE. — Contract for the construction of a steel bridge across the Yamhill river one mile south of Willamina, has been awarded to Portland Bridge & Iron Co., of Portland, at $9,000.

ENTERPRISE, ORE.—East Oregon Lumber Co. is making permanent survey for 20 miles of railroad to be built north from this place; J. C. Edsall, engineer, is in charge of the work.

OREGON CITY, ORE.—C. W. Raymor at approximately $8,000 submitted low bids to the county court for construction of a steel span bridge at Molalla and low bid for Barton bridge was submitted by A. C. U. Berry, Portland, at $13,206.

RIDDLE, ORE.—C. D. Edwards, president of the Nickel Mining & Smelting Co., Portland, says a plant with a 20-tons of ore daily capacity will be erected here; cost, $15,000.

SALEM, ORE.—Geo. W. Holcomb, of Portland, has been granted the right to divert 1,500 second feet of water from the Clackamas river in order to develop 10,225-horsepower; estimated cost, $1,000,000.

LOS ANGELES, CAL.—Pacific Reduction Co. has applied for a permit to erect a reinforced concrete reducing plant at 2654 Leonard street; cost, $30,000; building will be part one and part four stories, 40 x 175 feet and 40 x 40 feet respectively; latter to house the chemical tanks.

NORTH SACRAMENTO, CALIF.—The North Sacramento Water Co., a subsidiary of the North Sacramento Land Co., and operating the water system here, is erecting a pipe and pump shop near its new high pressure tank.

TRADE NOTES

MONONGAHELA CITY, PA. — The Cyclops Foundry Co. advises that its new foundry will be in operation shortly after July 1. The old plant was destroyed by fire Jan. 2, last. The new plant is fully equipped for the manufacture of light and heavy machinery castings, blast furnace castings and miscellaneous castings up to 15 pounds, of gray iron or semi-steel. The foundry is housed in a building 76 x 175 feet, and the pattern shop is 30 x 40 feet. The foundry will have a capacity of between 25 to 30 tons a day.

NEW YORK CITY.—The Twombly Car

Corporation, with offices at 1790 Broadway, which has had plans under consideration for at least two years for the manufacture of cycle cars, has leased the plant at Nutley, N. J., formerly occupied by the New York Motor Co. and will begin manufacturing cycle cars in about a month. The company purchased the equipment in the plant.

NEW YORK CITY.—The Alberger Pump & Condenser Co. will hold a special stockholders' meeting July 8, at its office, 140 Cedar street, New York. The propositions to be voted upon are an increase in the capital stock of the company from $500,000, consisting of 5,000 shares of common stock of par value of $100 per share, to $750,000, consisting of 5,000 shares of common stock of the par value of $100 each and 2,500 shares of preferred stock, par value of $100 each, which shall be entitled to 7 per cent cumulative dividends per annum. This preferred stock is not to have voting power and the corporation is to reserve the right to retire any or all of such preferred stock issued and outstanding upon any dividend day at the price of $110 per share.

CANADA

CALGARY, ALTA.—The Buckeye Engine & Foundry Co. is erecting a plant here including a foundry, 50 x 70 feet; cleaning room, 50 x 50 feet; blacksmith shop, 50 x 50 feet; pattern shop, 32 x 64 feet; and an office, 24 x 32 feet; plant to be ready for operation about Nov. 1.

VERNON, B. C.—Officials of the Canadian Northern railway plan to start construction this month on the 148-mile branch line from Kamloops to Okanogan valley.

New Trade Publications

ENGINE-DRIVEN COMPRESSORS. — A 16-page bulletin issued by the Chicago Pneumatic Tool Co., Chicago, is devoted to its line of gasoline and fuel oil engine-driven compressors adapted for a wide range of industrial uses.

ROLLS. — The Pittsburgh Iron & Steel Foundries Co., Midland, Pa., has issued a pamphlet entitled "Performances," which outlines the service obtained from "Adamite" rolls in mills of various classes. The list embraces specific instances in rod, bar, billet, skelp, rail, shape and tube mills and presents a record of high efficiency for "Adamite" rolls.

ELECTRIC HOISTS.—The Sprague Electric Works of the General Electric Co., 527 West Thirty-fourth street, New York City, has issued a 32-page booklet devoted to electric hoists adapted to a variety of handling operations in industrial plants. Numerous views of the application of these hoists are included and various types of this device are shown. A number of other booklets also have been issued by the Sprague Electric Works, which are devoted to electric fans, plug connectors, water tight floor boxes, etc.

FOUNDRY SUPPLIES AND EQUIPMENT. — A pocket-size catalog, containing 324 pages devoted to foundry supplies and equipment, has been issued by the S. Obermayer Co., Chicago. This catalog should prove of value to foundrymen generally, as it is of convenient size to permit of being carried in the pocket. Practically every conceivable article used in foundry operations is shown and described and a considerable section of this book is devoted to foundry equipment.

RIVETING HAMMERS. — Two bulletins, recently issued by the Ingersoll-Rand Co., 11 Broadway, New York City, are devoted to riveting hammers and rivet set retainers for hammers. All of the riveting hammers can be furnished with rivet set retainer, which is simple in design and meets the requirements of the safety laws being drafted by the various states. The bulletins are illustrated to show the application of the tools and contain sectional views illustrating details of construction.

FLEXIBLE SHAFT.—The Plank Flexible Shaft Machine Co., Grand Rapids, Mich., has issued a new 16-page catalog describing a full line of flexible shafts and portable grinding and drilling outfits. The plank flexible shaft is built on the tenon and mortise interlocking principle. The dead center of the shaft is not used as a driving member, but merely as a means of forming connections between the units. The catalog contains some interesting suggestions regarding the use of flexible shafts.

TRAVELING CRANES. — An unusually handsome catalog of electric traveling cranes has recently been issued by Niles-Bement-Pond Co., New York. The pages are 9 x 12 inches in size and the book includes many full page half-tone illustrations showing typical installations of Niles' cranes. The illustrations are supplemented by suitable descriptive matter. The front piece shows a bird's eye view of the crane works of the Niles-Bement-Pond Co. at Philadelphia. The book contains 90 pages.

STEAM SUPERHEATERS.—A very handsome 80-page cloth bound book has recently been issued by The Babcock & Wilcox Co., New York, describing the application of its line of superheaters to boilers of various types. The early pages of the book are devoted to an interesting sketch of the history of superheated steam, followed by chapters showing the application of Babcock & Wilcox superheaters to many different types of boilers. The book is handsomely and fully illustrated throughout with many full page half-tone plates.

EYE PROTECTORS.—An exceedingly interesting booklet entitled "The Prevention of Eye Accidents" has been issued by the Julius King Optical Co., New York City. Goggles to be worn by foundry operatives are illustrated and numerous letters are included testifying to the value of goggles in protecting the eyes in foundry operations. The eye protectors manufactured by this company afford complete protection for the eyes, yet provide a wide, unobstructed field of vision. An instructive chart is published which shows the anatomical distribution of accidents for the year 1913, in the plant of the Pullman Co., Pullman, Ill. Eye accidents lead with a total of 35 per cent, which proves the necessity of eye protection in various shop operations.

Low Prices

For Products Given as Cause of Alton Failure

St. Louis, July 14.—The Alton Steel Co., Alton, Ill., which was placed in the hands of a receiver by Judge Hadley, of the Madison county circuit court last week, had operated only about one year, manufacturing hoop steel and cotton ties. James Duncan, of Duncan Bros., was named receiver. Inability to get a fair price for its products is given as the cause for the receivership. It is expected that the company's plant will be operated by the receiver in a short time. The Alton Steel Co. was organized by T. S. Clark and associates, of Erie, Pa. Mr. Clark was elected president, J. R. Hastings vice president, M. L. Mozier secretary and E. J. Anglin superintendent. These four constitute the board of directors. The capital stock of this company was placed at $950,000. The Alton Banking & Trust Co. and three other Alton banks are responsible for the appointment of a receiver. They hold $200,000 of the first mortgage bonds of an issue of $300,000. The remaining $100,000 of this issue is held by F. W. Fownes and others of Pittsburgh. Other eastern financial interests hold $350,000 of second mortgage bonds; capital stock to this amount was reserve to meet this latter issue of bonds.

New Mill Burned.—The zinc concentrating mill of the Northern Ore Co., at Edwards, N. Y., was destroyed by fire recently, entailing a loss of about $40,000. The origin of the fire is a mystery. The mill had just been completed and had been in operation only about a week. It will be rebuilt at once. The zinc property at Edwards represents a new development which is being opened by Pilling & Crane, of Philadelphia.

The Pennsylvania Shafting Co., Spring City, Pa., has begun work on an addition to its plant to increase its capacity for the manufacture of Wright taper roller bearing for automobiles. This line was added by the company during the past year and has met with a large demand. The new addition will be equipped with screw machines, grinding machines, and other facilities for the manufacture of parts of these bearings.

The American Chain Co., Bridgeport, Conn., is about to erect a two and three-story, brick, steel and reinforced concrete building, 30 x 200 feet.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery Through Third Quarter.)

Bessemer, valley	$14.00
Bessemer, Pittsburgh	14.90
Basic, Pittsburgh	13.90
Basic, eastern Pa.	14.00 to 14.50
Malleable, Pittsburgh	13.90 to 14.40
Malleable, Chicago	14.00
Malleable, Philadelphia	15.50 to 15.75
Malleable, Buffalo	12.75 to 13.00
No. 1X Philadelphia	15.00 to 15.25
No. 2 foundry, Pittsburgh	13.90 to 14.40
No. 2 foundry, Cleveland	13.75 to 14.25
No. 2 foundry, Ironton	13.00 to 13.50
No. 2 foundry, Chicago	14.00
No. 2X foundry, Philadelphia	14.75 to 15.00
No. 2X foundry, New York	14.50 to 14.75
No. 2X foundry, Buffalo	12.75 to 13.00
No. 2 plain, Philadelphia	14.50 to 14.75
No. 2 plain, New York	14.25 to 14.50
No. 2 plain, Buffalo	12.50 to 12.75
No. 2 southern, Birmingham	10.00 to 10.50
No. 2 southern, Cincinnati	13.25 to 13.75
No. 2 southern, Chicago	14.85 to 15.85
No. 2 southern, Philadelphia	15.00 to 15.25
No. 2 southern, Cleveland	14.60 to 14.85
No. 2 southern, New York	14.75 to 15.00
No. 2 southern, St. Louis	14.50 to 15.00
Virginia, 2X, Philadelphia	15.30
Virginia, 2X, Jersey City	15.85 to 16.10
Virginia, 2X, New Eng., all rail	16.25
Gray forge (eastern Pa.)	13.75 to 14.00
Gray forge, Pittsburgh	13.65
Gray forge, Birmingham	9.00 to 9.50
Silveries, 8 per cent, Cleveland	17.55
Silveries, 5 per cent, Birmingham	12.50
Silveries, 5 per cent, Chicago	16.85
Standard low phos., Phila.	20.50
Lebanon low phos., furnace	17.00 to 17.50
Low phos., Pittsburgh	21.65 to 21.90
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.50
Charcoal, Buffalo	15.75 to 16.75
Charcoal, Birmingham	25.00
Middlesbrough, No. 3, Phila., ex ship	15.00 to 15.25

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bess., 51½ per cent	3.00
Mesabi, non-Bessemer, 51½ per cent	2.85

(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	7 to 8c
Foreign non-Bess., 50 to 65 per ent.	7 to 8c

COKE

(At the ovens.)

Connellsville furnace	$1.75 to 1.85
Connellsville fur. contr.	1.85 to 2.00
Connellsville foundry	2.25 to 2.60
Connellsville fdy., contr.	2.40 to 2.65
Wise county furnace	1.90 to 2.10
Wise county foundry	2.25 to 2.75
Pocahontas furnace	1.90 to 2.05
Pocahontas foundry	2.25 to 2.40
New River, foundry	2.75 to 3.50
New River, furnace	2.20 to 2.35

FERRO-ALLOYS

Ferro-manganese, Baltimore	$38.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent, Pgh.	22.90
Ferro-sil., 11 to 12 per cent, Pgh.	21.90
Ferro-sil., 10 to 11 per cent, Pgh.	20.90
Ferro-sil., 9 to 10 per cent, Pgh.	19.90
Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Bess. billets, Pbgh. and Yn.	$19.50 to 20.00
Open-hearth bil., Pbgh. and Yn.	19.50 to 20.00
Open-hearth bil., Phila.	21.90 to 22.40
Bess. sheet bars, Pbgh. and Yn.	20.00 to 20.50
Op.-h'th sh. bars, Pbgh. & Yn.	20.00 to 20.50
Forging billets, Phila.	26.40 to 27.40
Forging billets, Pittsburgh	24.00 to 25.00
Wire rods, Pittsburgh	25.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Light rails, 8 lbs., Pbgh. or Chi.	1.40c
Lgt. rails, 12 lbs., Pbgh. or Chgo.	1.35c
Lgt. rails, 16 to 20 lb., Pbgh. or Chicago	1.30c
Lgt. rails, 25 to 45 lbs., Pbgh. or Chicago	1.25c
Relaying rails, standard, Chgo.	$23.00 to 24.00
Relaying rails, light, Chicago	21.50 to 22.50
Angle bars, st. sect. Pbgh., base	1.50c
Angle bars, st., sections, Chgo.	1.50c
Spikes, railroad, Pbgh.	1.40c to 1.45c
Spikes, railroad, Chgo.	1.55c
Track bolts, Pbgh.	2.00c
Track bolts, Chgo.	2.00c

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.10c to 1.15c
Structural shapes, Chicago	1.28c to 1.33c
Structural shapes, Philadelphia	1.25c to 1.30c
Structural shapes, New York	1.26c to 1.31c
Structural shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.28c to 1.33c
Tank plates, Pittsburgh	1.10c to 1.15c
Tank plates, Philadelphia	1.25c to 1.30c
Tank plates, New York	1.26c to 1.31c
Bars, soft steel, Pittsburgh	1.10c to 1.15c
Bars, soft steel, Chicago	1.28c to 1.33c
Bars, soft steel, Philadelphia	1.30c
Bars, soft steel, New York	1.31c
Hoops, carloads, Pittsburgh	1.25c

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 pounds, to:—

New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11 cents
Baltimore	14½ cents
Cleveland	10 cents
Cincinnati	15 cents
Chicago	18 cents
Minneapolis and St. Paul	32 cents
Denver	67½ cents
St. Louis	22½ cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, plates and shapes	80 cents

Hoops, less carloads, Pittsburgh	1.30c
Bands, Pittsburgh	1.10c to 1.15c
Shafting, carloads, Pbgh., disc. contract	66
Shaft'g carloads, Pbgh., prompt,	67
Shaft'g less carl'ds, Pbgh., disc.	63
Bar iron, Chicago	1.05c to 1.10c
Bar iron, Philadelphia	1.20c to 1.25c
Bar iron, New York	1.25c to 1.30c
Bar iron, Cleveland	1.20c
Bar iron, Pittsburgh	1.25c
Hard steel bars, Chicago	1.25c to 1.30c
Smooth finish'g mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.80c to 1.85c
No. 28, black, Chicago	1.98c to 2.03c
No. 28, tin mill, black, Pbgh.	1.80c to 1.85c
No. 28, galvanized, Pbgh.	2.75c to 2.85c
No. 28, galvanized, Chgo.	2.88c to 2.93c
No. 10, blue annealed, Pbgh.	1.35c
No. 10, blue annealed, Phila.	1.50c
Tin plate, 100 lb., coke, base	$3.25 to 3.30

IRON AND STEEL PIPE

(Pittsburgh.)

	Black Butt-weld.	Galv.
Steel, ⅜ to 3 inches	80	71½
Iron, ⅜ to 2½ inches	70	61
	Lap-weld.	
Steel, 2½ to 6 inches	79	70½

BOILER TUBES

Steel, 3½ to 4½ inches	73
Iron, 3½ to 4½ inches	60

WIRE PRODUCTS

Wire nails, jobbers, Pittsburgh	$1.50 to 1.55
Wire nails, retailers, Pittsburgh	1.55 to 1.60
Plain wire, jobbers, Pittsburgh	1.30 to 1.35
Plain wire, retailers, Pittsburgh	1.35 to 1.40
Galvanized wire, jobbers, Pbgh.	1.70 to 1.75
Galvanized wire, retailers, Pbgh.	1.75 to 1.80
Polished staples, Pbgh.	1.50 to 1.55
Galvanized staples, Pbgh.	1.90 to 1.95
Barb wire, painted, jobbers, Pbgh.	1.50 to 1.55
Barb wire, painted, retail'rs, Pbgh.	1.55 to 1.60
Barb wire, galv., retailers, Pbgh.	1.95 to 2.00
Barb wire, galv., jobbers, Pbgh.	1.90 to 1.95

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 20; cut threads, 80 and 15; larger or longer, 75 and 15.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled, 80 and 25; cut, 80 and 20; larger or longer, 80.

Gimlet and cone point lag or coach screws, 80 and 25.

Hot pressed square, blank or tapped nuts, $6.30 off list; hot pressed hexagon blank or tapped, $7.20 off.

Cold pressed, c. and t. square, blank or tapped, $6 off; hexagon, blank or tapped, ⅝ inch and larger, $7.20; ⅝-inch and smaller, $7.80.

RIVETS

Structural rivets, Pbgh.	1.50c to 1.65c
Structural rivets, Chgo.	1.68c
Boiler rivets, Pbgh.	1.60c to 1.75c
Boiler rivets, Chgo.	1.78c

SCREWS

(New York.)

Lag, gimlet and cone point	80 and 20
Coach, gimlet point	80
Standard jack	70 and 10
Mch., cut thread, flat head	50 and 10
Mach., cut thread, round head	50 and 10 and 10
Mch., cut thread, fillister hd.	40 and 40 and 10
Mch., rolled thread, flat head or round head	80 and 10
Set screws, iron	75 and 10 and 10
Set screws, steel, per cent advance over iron	25
Square head cap screws	70 and 10 and 10
Hexagon head cap screws	70 and 10 and 10
Fillister head cap screws	60 and 10 and 10
Flat head wood screws	10 and 10 and 5
Round head wood screws	10 and 10 and 5

WASHERS

(Discounts, Iron or Steel, to Jobbers, Cleveland.)

⅛-inch	$7.25
3/16-inch	7.00
¼-inch	7.00
5/16-inch	7.00
⅜-inch	7.00

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

TWISTED REINFORCING BARS

(Soft steel, Pittsburgh mill.)

¾-inch and larger	1.20c to 1.25c
⅝-inch	1.25c to 1.30c
½-inch	1.30c to 1.35c
⅜-inch	1.45c to 1.50c
¼-inch	1.70c to 1.75c

IRON AND STEEL PRICES

Corrected up to Tuesday noon

TACKS

(New York.)—

	Discount.
American carpet tacks	90 and 20 and 10
American cut tacks	90 and 20 and 10
Railroad tacks	90 and 40
Gimp tacks	90 and 20 and 10
Finishing nails	70

WIRE ROPE

Galvanized, iron and steel	47½ and 2½
Bright, Iron and steel	55 and 2½

TRIANGLE REINFORCING MESH

(Per 100 square feet f. o. b. mill, car loads.)

No. 4, plain	$1.00
No. 4, galvanized	1.12
No. 7, plain	.49
No. 7, galvanized	.55
No. 23, plain	1.69
No. 23, galvanized	1.88
No. 26, plain	1.17
No. 26, galvanized	1.30
No. 27, plain	.96
No. 27, galvanized	1.07
No. 31, plain	2.49
No. 31, galvanized	2.76
No. 35 plain	1.17c
No. 35 galvanized	1.30
No. 39, plain	3.05
No. 39, galvanized	3.38
No. 43, galvanized	1.23
No. 43, plain	1.10

SPIRAL RIVETED PIPE

(Per 100 linear feet, f. o. b. factory.)

4-inch, plain	$ 19.76
4-inch, galvanized	30.74
6-inch, plain	33.05
6-inch, galvanized	49.73
8-inch, plain	43.17
8-inch, galvanized	65.00
10-inch, plain	66.42
10-inch, galvanized	96.15
12-inch, plain	83.75
12-inch, galvanized	118.30
14-inch, plain	99.14
14-inch, galvanized	138.85
16-inch, plain	117.53
16-inch, galvanized	166.58
20-inch, plain	183.79
20-inch, galvanized	248.39
24-inch, plain	219.92
24-inch, galvanized	293.99
30-inch, plain	324.81
30-inch, galvanized	430.64

CAST IRON PIPE

Three to 24 in., Cleveland	$22.35 to 22.80
Four-inch, water, Chicago	26.50
Six to 12 inches, Chicago	24.50
Larger sizes, Chicago	24.00
Six inch, water, New York	20.50 to 21.50
Four-inch, water, Birmingham	21.50
Six-inch and larger, Birmingham	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago	1.65c
Steel bars, Cleveland	1.80c
Steel bars, Cincinnati	1.70c to 1.85c
Steel bars, Philadelphia	1.65c
Steel bars, New York	1.80c
Iron bars, Chicago	1.65c
Iron bars, Cleveland	1.75c
Iron bars, Cincinnati	1.65c to 1.75c
Iron bars, Philadelphia	1.60c to 1.65c
Iron bars, New York	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago	1.75c
Shapes and plates, Cleveland	1.90c
Shapes and plates, Cincinnati	1.80c to 1.90c
Shapes and plates, Philadelphia	1.65c
Shapes and plates, New York	1.85c
No. 10 blue ann. sheets, Chgo	1.85c
No. 10 blue ann. sheets, Cleve	2.15c
No. 10 blue ann. sheets, Cinci	1.95c
No. 28 black sheets, Chgo	2.45c
No. 28 black sheets, Cleveland	2.60c
No. 28 black sheets, Cincinnati	2.45c to 2.55c
No. 28 galv. sheets, Chgo	3.45c
No. 28 galv. sheets, Cleveland	3.60c
No. 28 galv. sheets, Cincinnati	3.40c to 3.55c

IRON AND STEEL SCRAP

(Net tons.)

No. 1 railroad wrought Chgo	$ 9.00 to 9.25
No. 1 railroad wrought, Cleve	9.50 to 10.00
No. 1 railroad wrought, St. L	7.75 to 8.00
No. 1 railroad wrought, Cinci	8.00 to 8.50
No. 2 railroad wrought, Chgo	8.50 to 9.00
No. 2 railroad wrought, St. L	7.50 to 7.75
Arch bars and transoms, Chgo	12.00 to 12.25
Arch bars and transoms, St. L	11.00 to 11.50
Knuckles, coup. and spr'gs, Chgo.	9.00 to 9.50
Knuckles, coup. & sp'gs, St. L.	9.25 to 9.50
Shafting, Chicago	11.50 to 12.00
Shafting, St. Louis	13.00 to 13.50
Steel car axles, Chgo	12.00 to 12.25
Steel car axles, St. Louis	11.75 to 12.25
Locomotive tires, Chicago	9.25 to 9.50
Locomotive tires, St. Louis	8.75 to 9.25
Cut forge, Chicago	8.50 to 9.00
Pipes and flues, Chicago	6.50 to 7.00
Pipes and flues, Cleveland	7.75 to 8.25
Pipes and flues, St. Louis	5.75 to 6.25
No. 1 cast, Chicago	9.75 to 10.00
No. 1 cast, Cleveland	10.00 to 10.50

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley furnaces	1.20
Cincinnati	2.00

No. 1 cast, Cincinnati	$ 8.50 to 9.00
No. 1 cast, St. Louis	9.50 to 10.00
No. 1 busheling, Chicago	7.25 to 7.75
No. 1 busheling, Cleveland	8.25 to 8.50
No. 1 busheling, Cincinnati	5.75 to 6.25
No. 1 busheling, St. Louis	7.25 to 7.50
No. 2 busheling, Chicago	6.00 to 6.25
No. 1 boiler plate, cut, Chgo	6.50 to 7.00
No. 1 boiler plate, cut, Buffalo	9.00 to 9.50
No. 1 boiler plate, cut, St. L	6.00 to 6.50
Boiler punchings, Chicago	9.00 to 9.25
Cast borings, Chicago	4.75 to 5.25
Cast borings, Cleveland	6.00 to 6.25
Cast borings, Cincinnati	4.25 to 4.75
Cast borings, St. Louis	4.00 to 4.50
Machine shop turnings, Chgo	5.25 to 5.50
Machine shop turnings, Cleve	5.00 to 5.25
Machine shop turnings, Cinci	4.25 to 4.75
Machine shop turnings, St. L	4.50 to 5.00
Malleable, agl., Chicago	7.75 to 8.25
Malleable, agricultural, St. Louis	7.50 to 8.00
Malleable, railroad, Chicago	8.75 to 9.00
Malleable, railroad, Cincinnati	6.50 to 7.00
Malleable, railroad, St. Louis	7.50 to 8.00
Angle bars, iron, Chgo	11.75 to 12.25
Angle bars, iron, St. Louis	10.00 to 10.50
Angle bars, steel, Chgo	8.25 to 8.75
Angle bars, steel, St. Louis	9.25 to 9.50
Stove plate, Chicago	8.50 to 8.75
Stove plate, Cleveland	7.75 to 8.00
Stove plate, Buffalo	9.75 to 10.00
Stove plate, Cincinnati	6.50 to 7.00
Stove plate, St. Louis	8.25 to 8.75
Bundled sheet, Cincinnati	4.00 to 4.50
Wrought iron pil'g plates, Clev.	13.00

(Gross Tons.)

Heavy melting steel, Pbgh	$11.75 to 12.00
Heavy melting steel, Buffalo	10.00 to 10.50
Heavy melting steel, Chicago	9.50 to 9.75
Heavy melting steel, Cleveland	10.00 to 10.50
Heavy melting steel, Cincinnati	9.00 to 9.50
H'vy melting steel, eastern Pa	10.50 to 11.00
Heavy melting steel, New York	8.50 to 8.75
Heavy melting steel, St. Louis	11.00 to 11.50
Bundled sheet, Buffalo	6.25 to 6.50
Grate bars, Buffalo	9.50 to 10.00
Grate bars, New York	5.25 to 5.50
No. 1 railroad wr'ght, east. Pa	12.50 to 12.75
No. 1 railroad wrought, Pbgh	11.00 to 11.50
No. 1 R. R. wght., New York	10.25 to 10.50
No. 1 R. R. wrought, Buffalo	11.00 to 11.50
Shafting, New York	11.00 to 11.50
Pipes and flues, New York	7.00 to 7.25
Pipes and flues, eastern Pa	9.25 to 9.75
Mch. shop turnings, New York	5.50 to 5.75
Machine shop turnings, Buffalo	5.50 to 6.00
Mch. shop turnings, Pbgh	7.75 to 8.00
Mch. shop turnings, eastern Pa	7.50 to 8.00
Cast borings, New York	5.50 to 5.75
Cast borings, eastern Pa	8.00 to 8.50
Cast borings, Buffalo	6.00 to 6.50
Cast borings, Pittsburgh	8.00 to 8.25
Stove plate, (Jersey points)	8.00 to 8.25
Stove plate, Pittsburgh	9.25 to 9.75
Stove plate, eastern Pa	8.50 to 9.00
Shoveling steel, Chicago	9.00 to 9.50
Shoveling steel, St. Louis	8.00 to 8.25
Reroll'g rails, 5 ft. & ov., Pbgh	13.00 to 13.25
Reroll. rails, 5 ft. and ov., Chgo	11.25 to 11.75
Reroll. rails, 5 ft. and ov., Cleve	11.00 to 11.50
Reroll. rails, 5 ft. & ov., E. Pa	12.25 to 12.75
Reroll. rails, 5 ft. and ov., St. L	11.25 to 11.50
Steel rails, short, Chicago	10.25 to 10.50
Steel rails, short, Cleveland	12.50 to 13.00
Steel rails, short, eastern Pa	11.00 to 11.25
Steel rails, short, St. Louis	10.50 to 10.75
Iron rails, Cleveland, nom	13.25 to 13.75
Iron rails, Cincinnati	10.25 to 10.75
Iron rails, eastern Pa	15.00 to 16.00
Iron rails, St. Louis	11.00 to 11.25
Frogs, switches, guards, Chgo	9.50 to 9.75
Frogs, switches and g'rds, St. L	10.50 to 10.75
Car wheels, (iron), Pittsburgh	11.25
Car wheels, (steel), Pittsburgh	12.25 to 12.50
Car wheels, Chicago	10.75 to 11.00
Car wheels, eastern Pa	11.00 to 11.50
Car wheels, Buffalo	12.00 to 12.50
Car wheels, N. J. points	10.50 to 11.00
Car wheels, St. Louis	11.00 to 11.25
Iron axles, Pittsburgh	20.50 to 21.00
Iron axles, Cincinnati	19.00 to 20.00
Iron axles, eastern Pa	20.00 to 21.00
Iron axles, Buffalo	21.50 to 22.00
Iron axles, Chicago	18.00 to 18.75
Steel car axles, New York	12.00 to 12.50
Steel car axles, Buffalo	15.00 to 15.50
Steel car axles, Cleveland	14.00 to 16.00
Steel car axles, eastern Pa	14.00 to 14.50
No. 1 busheling, Buffalo	8.50 to 9.00
No. 1 busheling, Pittsburgh	9.00 to 9.50
No. 2 busheling, Buffalo	6.00 to 6.50
Low phosphorus steel, Buffalo	15.00 to 15.50
Low phosphorus steel, Pbgh	14.00 to 14.50
Low phos. steel, eastern Pa	14.50 to 15.00
No. 1 forge, eastern Pa	8.50 to 9.00
No. 1 cast, eastern Pa	12.00 to 12.50
No. 1 cast, Pittsburgh	11.25 to 12.25
No. 1 heavy cast (N. J. points)	11.25 to 11.50
Boiler plate, Cleveland	8.50 to 9.00
Mall. iron, agricul., Cleveland	9.00 to 9.50
Mall. iron R. R. Cleveland	10.25 to 10.75
Malleable, railroad, Pittsburgh	10.50 to 10.75
Malleable R. R. Buffalo	10.75 to 11.25
Mall., R. R. east. Pa	9.00 to 9.50
Bundled sheet, Pittsburgh	8.50 to 8.75
Bundled sheet, Cleveland	7.50 to 8.00

MISCELLANEOUS SHOP TOOLS

	Discount.
Standard files	80 and 5
Heavy hammers, 3 to 5 lb	80 and 10
Heavy hammers, over 5 lb	80 and 5
Gas pliers, 7-inch, per dozen	$2.00
Gas pliers, 12-inch, per dozen	3.50
Cold chisels, per pound	10c to 15c
Wrenches, Alligator, discount	75 and 80
Wrenches, drop forged S	50 and 10

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Methods of Determining Hardness

(*Continued from page* 118)

Brinell test is useful for constructive material; it is easily applied and definite. It can't be applied to very brittle substances like glass and hard minerals. Keep's test is especially suited for castings of all kinds, for it records whole thickness, and gives indications of blow-holes and spongy places.

Saniter concluded that while a high Brinell number may be expected to give better wear, there are so many exceptions that its use for the purpose of indicating wearing qualities is unreliable.

Experiments with various metals show that the force of the blow in the Brinell test is sufficient to cause a certain amount of hardening, whereby too high values are obtained. Hence, this test never gives true hardness values. A knowledge of the physical properties of metals is necessary to obtain a clear conception of the significance of the hardness test.

Metals Must Be in Normal Condition

If the two metals are selected, whose hardnesses are to be compared by the scleroscope, the metals must be in a normal condition; they must not be in a "worked-hard" condition, but just as the heat-treatment left them. Metals in this condition must be either in the form of castings or wrought metals in the annealed state; or if steel, there must be no mechanical hardness due to hammering or rolling. The reason for this is that when any of these metals are subjected to pressure, then whatever change is caused in them is due to pressure, and this will superharden them. In using the Shore scleroscope, the glass tube must be perfectly plumb, the surface to be tested must be normal to the line of impact, and the surface must be ground absolutely smooth and be free from all tool marks. The harder the specimen, the smoother should be the surface. In determining the hardness of hot-worked materials, the surface decarbonization must be removed in order to obtain the true value. In the Brinell method, the hardness number is influenced by the size of the ball and by the load; smaller balls at equal loads, and greater loads with equal balls yield greater hardness numbers.

An addition of even a trace of impurity often produces marked changes in the degree of hardness of metals. Hardness of steel varies with the percentage of carbon within certain limits of temperature and with the rapidity of cooling. If it is brought to too high a temperature and quenched from this temperature, it becomes too brittle; if the temperature was too low before quenching, the steel will be insufficiently hardened. In hardening steel, it is necessary to heat to 750 degrees, Cent. Steel with 0.7 per cent carbon, heated to 750 degrees and quenched was three times as hard as when heated to only 700 degrees. The hardening capacity of steel increases with the carbon present up to 0.45 per cent, remains constant to 0.9 per cent and then decreases. Hardening is difficult to detect below a carbon percentage of 0.3 per cent. Hardening also raises the elastic limit. In hardening, the specific gravity decreases directly with the per cent of carbon, and with the temperature to which the steel had been heated. Tungsten imparts hardness to steels, but less so than chromium. The composition of a steel influences the resistance to wear considerably. Robin found that nickel, chromium and vanadium each increased the resistance of steel to wear. Nusbaumer found remarkable resistance to wear of low carbon steels having a manganese content of 1.5 per cent. Saniter concluded that chrome-vanadium and nickel-chrome steels gave greater wear with greater hardness than simple carbon

steels with about 0.7 per cent carbon and 0.60 per cent manganese.

Summary

When the Shore test can be satisfactorily applied, it is the easiest and quickest to operate, and requires the least skill. It is very useful for testing cold-rolled material and tempered cutting tools at different points on the cutting edge. Many machine shops today apply some form of hardness test to every new material that comes to them, and from the results of these tests, they can determine the best heat for tempering and best shape of tool to get the most economical work. The Shore test may also be used for testing for segregation. For case-hardened steels, the Brinell test seems to be the best adaptable method, although all instruments which test the surface only are liable to give misleading indications.

In testing the machining qualities of iron castings, the Keep drill is used. The wearing qualities of rails are probably best tested by the Brinell method.

Since the special properties needed for one class of industrial uses necessarily differ from those needed for certain other industrial uses, for each industrial purpose, we should use the test which is shown by experience to give the best measure of usefulness in that particular service. It is hardly to be supposed that any one hardness test will ever become the universal one.

Coke Production in Indiana and Illinois

The production of coke in Indiana in 1913 was 2,727,025 short tons, valued at $13,182,136, which was an increase over 1912 of 110,686 tons in quantity and $653,451 in value, and over 1911 of 1,810,614 tons in quantity and of $9,583,941 in value, according to E. W. Parker, of the United States Geological Survey.

All the coke made in Indiana is the product of retort ovens, and most of the coal used is brought from West Virginia. Indiana assumed importance in the manufacture of coke in 1911, when a portion of the United States Steel Corporation's plant at Gary was completed and put in blast. The entire plant was completed in 1912 and Indiana, from a relatively low place in the rank of coke-producing states in 1910, advanced to third place, outranking West Virginia, upon whose mines the ovens in Indiana depend for the greater part of their coal. The plant at Gary consists of 560 Koppers ovens, which in 1913 produced 90 per cent of the entire output of the state. The total number of ovens in the state at the close of 1913 was 749, and 41 were under construction. Ten of the old beehive ovens at Black Creek were abandoned. The 749 ovens had an average production of 3,670 tons of coke and an average yield of coal in coke of 77.1 per cent.

As in Indiana, all the coke made in Illinois is the product of retort ovens, which draw most of their coal from West Virginia mines. A common practice is to mix the West Virginia coal with Illinois coal in the proportion of 4 to 1. The mixture is ground fine and has been found to make an entirely satisfactory coke, with a yield of coal in coke of approximately 75 per cent. There are four establishments with a total of 568 ovens, all of which were in operation during the year. There were 58 new ovens in construction at the end of the year, 40 at South Chicago and 18 at Joliet, both installations being additions to plants already established.

The production of coke in Illinois increased from 1,764,944 short tons, valued at $8,069,903, in 1912 to 1,859,553 tons, valued at $8,593,581, in 1913, a gain in quantity of 94,609 tons, and in value of $523,678. In neither Indiana nor Illinois are there any of the beehive coke plants.

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EAU CLAIRE, WIS. Works on North Side

Opportunities

Men Wanted
Minimum, 50 words, $1.00. Each additional word, 2c. All capitals, 50 words, $1.50. Each additional word, 3c.

Position Wanted
Minimum, 25 words, 50c. Each additional word, 2c. All capitals, 25 words, 75c. Each additional word, 3c.

Miscellaneous Classified
Minimum, 25 words, $1.00. Each additional word, 4c. All capitals, 25 words, $2.00. Each additional word, 8c.

Men Wanted

UNDERSIGNED COUNSEL WILL CONFIDENTIALLY negotiate preliminaries for important executive, technical, administrative and professional positions, insuring strictest privacy. Not an agency, but a highly-endorsed, high grade method of negotiating preliminaries only, for $3,000 to $12,000 men. Send address only for explanation. R. W. Bixby, Lock Box 134-E9, Buffalo, N. Y.

WANTED: — A-NO. 1 FOREMAN FOR gray iron foundry in middle west doing railroad work; open shop; must be a hustler; state age, experience and references, also salary wanted. Address Box 189, THE IRON TRADE REVIEW, Cleveland, O.

WANTED—A HEATER FOR 14-INCH mill. Buffalo Steel Co., Tonawanda, N. Y.

WANTED—FIRST-CLASS CORE ROOM foreman for steel foundry. Reply to Box 206, THE IRON TRADE REVIEW, Cleveland.

THE BEST WAY TO GET A GOOD POSITION in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

Positions Wanted

MECHANICAL ENGINEER, TECHNICAL graduate, 29 years of age, married; experienced as master mechanic of rolling mills, power plants and cement plants, or capable of taking charge of pattern shop, brass or iron foundry, machine shop or smith shop. Address Box 101, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY SUPERINTENDENT OR general foreman; up-to-the-minute in modern practice; 20 years' executive experience in largest iron, steel and malleable foundries; can lower manufacturing cost and solve most difficult shop problems; seeks change where results and close attention to business would be appreciated. References. Address Box 186, THE IRON TRADE REVIEW, Cleveland, O.

MILL SUPERINTENDENT — IRON OR steel; extensive experience in management; good executive and producer; references; guarantee results; moderate salary. Address Box 193, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED BY MAN WITH ten years' experience to take charge of foundry office; understands estimating, costs, cupola practice, etc.; prefer New England location. Address Box 196, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED BY A CHEMIST, 27, with several years' experience in iron and steel works laboratories. Address Box 199, THE IRON TRADE REVIEW, Cleveland.

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If different results are desired, now is the time. This EXECUTIVE is big enough to rearrange or rejuvenate a large proposition. Have changed run-down plants and losses to modern equipment and profits with minimum expenditure. Thorough technical, shop, designing, office, commercial and financial training combined. Successful record, reorganizing personnel and modernizing products, equipment, methods and financial conditions. 20 years' manufacturing experience, 4 years' under the Taylor System of Scientific Management. Would consider small proposition, if opportunity afforded acquiring substantial interest. Business must be financially sound. Address Box 201, THE IRON TRADE REVIEW, Cleveland, O.

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POSITION AS FOREIGN TRAVELER, foreign sales-manager or assistant by man of extensive experience in foreign field and knowledge of principal foreign languages including Russian and Spanish. Address Box 197, THE IRON TRADE REVIEW, Cleveland, O.

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WANTED: — JOB AS LOCOMOTIVE craneman; can handle the Browning and McMyler; several years' experience; will go any place; can give the best of references. Address H. S. Alexander, care of S. O. Co., Sec. 16, Taft, Cal.

PURCHASING AGENT WITH EXCELlent qualifications solicits correspondence from large concerns in need of greater buying efficiency. Young man; 15 years' experience; progressive; best references. Address Box 200, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY SUPERINTENDENT OR foreman wants position; experienced on machinery and general jobbing; good cupola practice; mix by analysis; best references. Address Box 202, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS SUPERINtendent or foreman; stove foundry preferred; correspondence invited from firms in need of a good man. Address Box 204, THE IRON TRADE REVIEW, Cleveland, O.

Sales Agents

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